

NEWS BRIEFS

To Go Or Stay

Washington DC FCC Mass Media Bureau Chief Alex Felker said he is evaluating his options as personnel changes take place at the Commission with the departure of Chairman Dennis Patrick.

"I'm thinking about everything, but I'm a long way from making a decision," Felker said.

Felker is a "career" employee at the Commission and his secu-

rity at the FCC is not dependent on political whims.

The Power of Talk

Washington DC Why is late night America listening to AM?

Well, the NAB attributes an increase in listening in five major markets at night to "talk" programming.

Based on fall Arbitron ratings, five major markets, Boston, Pittsburgh, Los Angeles and San

Francisco, are "majority" AM markets in the overnight daypart (midnight to 6 AM), an increase of three from spring 1988.

Capitol Hill also is worried that talk show hosts may cause a stir among listeners with the troubles of House Speaker Jim Wright, as they did with the congressional pay raise that went down the tubes.

TV Marti Plans Proceed

Washington DC Congress is moving ahead to establish a TV version of Voice of America's Radio Marti aimed at Cuba, despite interference jamming of US

AMs.

The proposed legislation would allow the FCC to confiscate a frequency—in use or not—to broadcast.

TV Marti would be broadcast via a transmitter from a balloon over the Florida Keys.

In other VOA news, the agency said it will employ two new 500 kW shortwave transmitters in West Germany to improve its signal in Eastern Europe and the Soviet Union. The VOA already uses four 500 kW units to broadcast.

Noting that *glasnost* resulted in a cessation of jamming by the Soviet Union, VOA said it has

"surprising" opportunities.

"During meetings . . . , visiting Soviet diplomats actually asked VOA to improve its signal to the Soviet Union," VOA said.

Back At Full Power

Bethesda MD WGMS-AM here recently replaced its wind-damaged directional tower and is transmitting a full-power directional signal, according to GM Michael Ferrel.

Ferrel said a new \$75,000 tower was erected by 12 April to replace one destroyed by a wind storm 28 December.

The station lost its directional transmission when severe thunderstorm winds knocked down one of its four towers.

The downed tower forced the station to convert its 5000 W daytime/1000 W nighttime directional signal to a weaker 1000 W daytime/250 W nighttime omnidirectional signal for nearly four months.

The AM signal is aimed southeast toward Washington, DC.

Radio History Remembered

Washington DC Among special projects approved by the Corporation for Public Broadcasting is a TV documentary about the "creators of radio," Lee de Forest, Edwin Howard Armstrong and David Sarnoff.

The documentary titled "Radio Pioneers" will be "the compelling story of the life and times of three men who completely transformed modern America."

The production is through WETA-TV in Arlington, VA, with Tom Lewis and Ken Burns of Lorentine Films, Walpole, NH.

The Numbers

Washington DC The latest statistics from the FCC show there were 10,524 AM and FM stations broadcasting as of 31 March.

The figures break down to 4948 AMs; 4188 FMs, and 1388 non-commercial FMs.

INDEX

A Poor Man's Distribution Amp	19
by John Shepler	
Solid State Diode Operation	20
by Ed Montgomery	
Assembling Your MIDI Studio	22
by Bruce Bartlett	
Sightless CEs Share AM Vision	23
by Dee McVicker	
Making the Switch to Digital	26
by Mel Lambert	
Midwest Call Signs and Border Radio	27
by George Riggins	
A Guide to Extra CD Mileage	29
by Laura Tyson	
Annual "Proof" Requirements	37
by Harold Hallikainen	

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Review Urged of FM DA Ruling

by Alan Carter

Washington DC Broadcast and interest groups, as expected, asked the FCC to re-examine new rules that allow short-spaced FM stations by use of directional antennas.

The NAB and the Washington engineering firm of du Treil, Lundin & Rackley filed petitions for reconsideration in April citing complaints from limited applications to shortcomings for interference protection.

Greater Media called for a review of limits on the degree of permissible short spacing, restrictions on incursions into the aperture of a directional antenna by other antennas and other potentially re-radiating objects, and a reconsideration of conventional waivers for minor short spacing.

The Association for Broadcast Engineering Standards (ABES) questioned the "wholesale election" of permitting new FMs on the basis of less than minimum mileage separations.

Other petitions were filed by Genesis Broadcasting and Mullaney Engineering of Gaithersburg, MD.

The do's and don'ts

The new rules, adopted under Docket MM 87-121, are expected to be effective by early to mid-June, pending approval

of new filing forms by the Office of Management and Budget. The original effective date had been 14 April.

FCC staff speculated there would be action on the petitions for reconsideration by the effective date.

Broadcasters no longer can apply for waivers for co-channel and adjacent channel short spacing. The FCC requires

date be deferred pending further study.

Among the charges, du Treil said in many cases the proposed rules will not permit adjacent-channel short spacing.

Questions abound

The firm also said that by codifying the 2 dB per 10° directional antenna policy, many stations will have "needless" an-

examine whether installation instructions of FM antenna manufacturers should become a formal part of the application; whether a registered professional engineer should be required to sign all technical documents on design and installation and measurement of an FM DA, and whether necessary safeguards should be adopted to protect FMs from interference stemming from antenna deterioration.

ABES also asked the FCC to consider strengthening technical and procedural requirements on design and installation of DAs. The group noted that directional antennas used to give "equivalent" contour protection "ought to be limited to the resolution of site availability problems not solvable by other means."

For information from the FCC on directional antennas, call 202-632-9660.

... because of the FCC's FM application processing resources, permissible short spacing initially will be limited to eight kilometers, or five miles.

applications to protect facilities similar to contour protection criteria currently used in the non-commercial service.

The maximum amount of short spacing is limited by the amount of separation specified for the next smaller size station class. But because of the FCC's FM application processing resources, permissible short spacing initially will be limited to eight kilometers, or five miles.

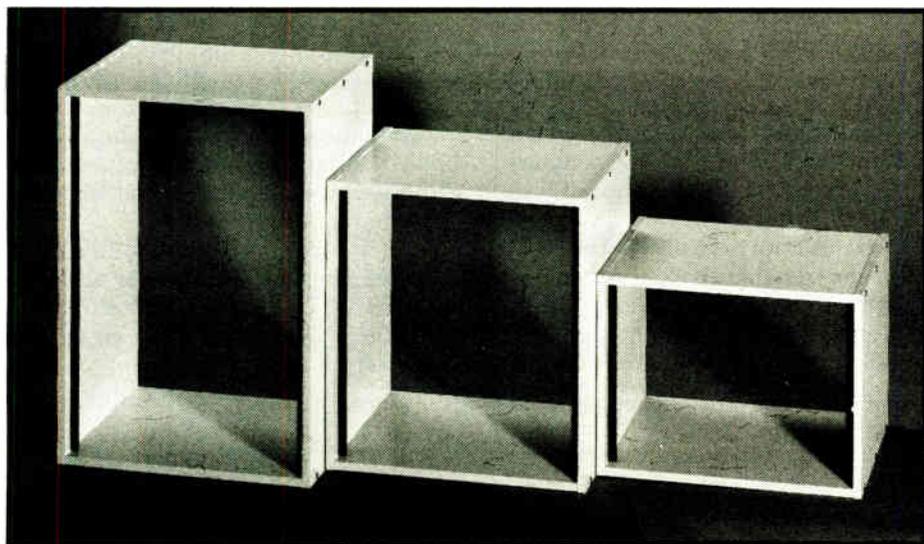
In its petition, du Treil, Lundin & Rackley charged that the rules apply only to a portion of potential short-spaced stations, among other complaints. The firm asked that the effective

date be deferred pending further study. Rules governing antenna placement and tower construction, the petition continued, are arbitrary and unnecessary.

On the controversial issue of received interference, du Treil argued that received interference should be permitted in areas not presently served.

The NAB asked for a further notice of proposed rule making, claiming the decision, among issues, lacks necessary safeguards to avoid interference in FM. NAB specifically suggested the FCC

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AM's Golden Chance Arrives

by Judith Gross

Falls Church VA Okay, you've read many words in *RW* over the past few years about the development of the NRSC standard.

We've gone to the meetings, reported the filings, the tests, the debates, the pros and the cons. As someone who has been at a lot of those meetings, I feel a personal connection with the concept behind this effort which was begun with the idea of doing something to help AM.

And now it's official.

The FCC did not go ahead and do what the NRSC and the NAB asked for, namely define a preemphasis curve and ceiling in a station's audio chain.

It's understandable that the Commissioners would prefer to deal with transmission concerns instead.

But think of it. Here we are, in a time of deregulation: fewer rules, relaxed standards and yet the industry was still successful in convincing the Big Three over on M Street that AM needs a tightening of the rules in order to survive.

Broadcasters were willing to sacrifice 5 kHz of their allowable spectrum to help AM. It's 5 kHz that no AM listener benefits from anyway, but it was still rightfully theirs.

And all of this was done through a compromise effort. That's right. Station folks sitting down with processor folks sitting down with receiver manufacturers and—despite the occasional heated disagreements—all trying to make it work so AM could survive.

What we do finally have is a mandatory standard which will almost immediately alleviate second adjacent interference. So the receiver manufacturers can go ahead now and make wideband AM radios—giving us the fidelity we need.

It's kind of ironic that it took the FCC to make a new rule to help AMers when it was the Commission's own free-

wheeling policies that put AM in its predicament to begin with. But there it is.

And where do we go from here? Well, stations have about a year to implement the standard, and if they go about it the most convenient way—namely by installing NRSC-1 processing in their audio



chain—they won't have to worry about the FCC (or their neighboring adjacent stations) breathing down their necks over the next five years.

By mid 1994 they will have to prove that their transmitted signal conforms to NRSC-2—the RF mask. But why wait? Now's the time for stations to show the receiver manufacturers and the listeners how good AM can really sound. Let's show 'em we're ready.

☆☆☆

There's a fascinating book making the rounds these days. It has little to do with the broadcast industry directly, but what it says about every aspect of American business is too important to ignore.

The book is called *More Like Us*, published by Houghton Mifflin and written by a fellow named James Fallows, who lived in Asia (including Japan) for a few years, was a speechwriter for President Carter and authored a previous book about waste in our defense programs which caused quite a stir.

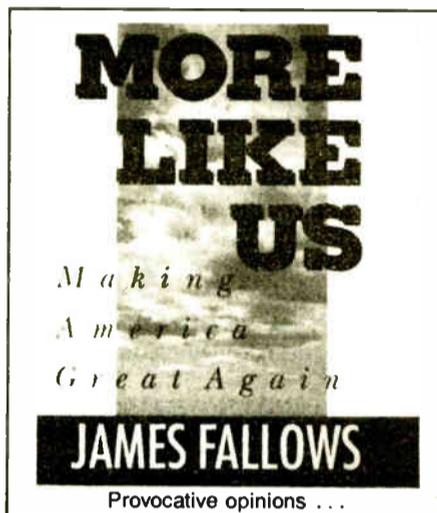
The latest book tackles the thorny problem of why our country lags behind the Japanese in the world economic mar-

ket and it explores some of the entrenched cultural difficulties which are allowing Japan to succeed where we seem to be failing.

But unlike many books of its ilk you may have seen these days, Fallows doesn't say that America should be more like the Japanese in order to prosper. Quite the contrary.

He says that we should go back to the basic foundations of America which helped us grow to be the giants we have been for so many decades. In other words, don't be more like them, be "More Like Us," and thus the book's title.

What he's talking about is the feeling



of openness, that anybody from any social or economic strata has a chance to get ahead in the US: create a new identity for him- or herself. The "Land of Opportunity." He says people try harder when they feel they've got a chance.

What's interesting about all of this, in light of the current controversy over whether or not to license broadcast engineers, is that the book is a stinging indictment of restrictive qualifying processes such as licensing and tests.

Fallows says that such professional re-

quirements have rarely helped those who use the services of the professionals in question, rarely raise the quality of work performed and usually only serve to keep those already licensed secure in a kind of "old boys' club."

"The licensed professions focus attention on how a teacher or accountant or doctor trained for his job—did he go to the right school and get the right credential?—while simultaneously discouraging measurements of how well the people already in the profession do their work," Fallows writes.

He adds that once in the "club" there is almost never any continued scrutiny as to how competently the licensed professional actually performs.

He also notes that geniuses like Thomas Edison and Frank Lloyd Wright had almost no formal training in any profession; Edison didn't even finish grade school.

Fallows goes on to quote Richard Boyatzis, who heads a consulting firm called McBer. Boyatzis says that despite professional groups' claims that licensing helps raise standards in the profession, the end result is usually "the exclusion of certain groups, whether by intention or not, and the establishment of mediocre performance."

Sound familiar? The book goes on to suggest that if we want to encourage the talent that does exist out there, we would be wise to forget about professional credentials and "let people perform whatever service or profession they've shown they can perform competently."

Something for the NSPE, the SBE and our industry's own very competent but unlicensed engineers to ponder as the debate rages on.

Heard something interesting? Spill your guts to Earwaves. Write PO Box 1214, Falls Church VA 22041, or call me at 703-998-7600. Best tidbit of the month wins a coveted 1989 edition *Radio World* mug.

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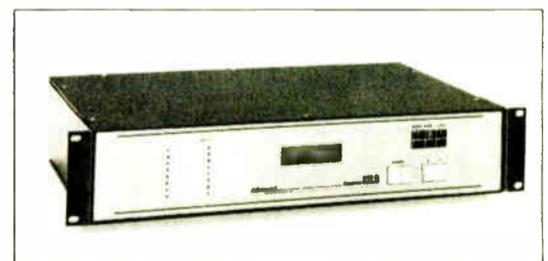
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Finding and keeping talent

Dear RW:

In responding to Robert Orr's guest editorial of 22 February . . . how right you are, sir. What, as a whole, has the industry done to create a climate of interest and trust to attract new blood? Furthermore, what is the industry doing to keep good people?

I am not a tyro; I've spent almost 20 years in this business as a reasonably successful announcer-copywriter-production talent. Yet, I must admit I've never felt my future any bleaker.

I don't do drugs and I don't drink. I show up on time, work hard, prep my afternoon show. I put in five hours a day as one of my station's lead production people.

My boss is a darned good man and pays me relatively well. But about a year ago, a personal situation came up which forced me to "test the market" to see if I could find anything better.

Out of roughly 50 air-checks and resumes sent out (forty of which were to advertised job openings) I got less than five responses. Of any kind.

Of those, two responses indicated an interest, but made it clear that I'd have to take a substantial cut in pay, work more hours and stand little or no chance for advancement . . . *yet these were jobs at much larger markets than that in which I already worked!*

I began to think that after 20 years, I was no better than "mediocre." In fact, after a recent vacation, listening to announcers and production all over the

country, I came to the conclusion that actually I was pretty good at my job . . . but that by and large, radio was being ruled by "bottom line" thinking.

What do I mean? Simply, with the advent of satellite and "packaged programming" most radio stations today are doing (or looking at doing) the obvious: if you cut overhead drastically, you don't need to incur as much revenue to make a profit.

Furthermore, there is seldom any good reason to try to keep anyone like myself who has a wealth of experience and ability. Most clients will sit still for "rip and read" spots if the rate card is right, so there isn't the need for even a good production person—just someone who can speak clearly and work fast.

I used to get phone calls from kids interested in a broadcasting career. I'd warn them that they'd have to start at a small radio station and work their way up. Now I tell them "don't bother." There isn't any ladder in place anymore.

Quite frankly, after being a dedicated professional in this business for almost 20 years, I think I'd seriously consider getting out if the right offer came along. There just isn't much incentive to stay in.

I knew we were in trouble the day I learned that a 20-year-old fellow who worked with us one summer as a news intern (and a darn good one) gave up trying to make a career as a radio newscaster, and is now day manager of a fast food restaurant near here.

And this person, after six months on the job, makes more in income and benefits than I do, after 20 years on the job. And you wonder why radio has problems attracting and keeping good people?

Kent Welborn
Kennewick, WA

Fighting the gender gap

Dear RW:

Regarding your response to Tammy Veil's answer to WMAQ's Margaret Bryant (RW 15 January 1989), from across the Atlantic Ocean comes yet another woman in the field of engineering who agrees with you in a big way that being a woman engineer is not just tough, but real tough.

In my still-developing country of Swaziland, you can imagine what it means to be a woman and have to face the fact that you cannot be accepted readily as a competent person. If you are lucky enough to survive the lack of recognition and unequal pay then you are faced with the problem of coordinating work and home hours.

In our country there is still plenty of land to plow, so we women are expected to do all that is involved in the fields, kitchen and to mind the kids as well.

Adding into daily account that my home is out in the "boonies," that our transport is not reliable and roads are unpaved does nothing to help. On wet days, which are common here, it's sheer chance to pass through the slippery parts. Such things do nothing to help in

The FCC has handed AM stations a life preserver with the mandatory NRSC standard—but it's a gift accompanied by responsibilities.

The 10 kHz stopband and specifications of NRSC-2, which the Commission approved over NRSC-1, go a long way towards reducing second adjacent channel interference.

But since the new rule stopped short of defining the preemphasis curve and ceiling of NRSC-1, there is still concern about first adjacent splatter.

In addition, receiver manufacturers may not feel the urgency of supplying radios with a complementary deemphasis curve if they are unsure whether stations will voluntarily conform to NRSC-1.

It's understandable that the Commission did not want to tread on the sacred ground of a station's audio processing and opted instead for a transmission standard.

No Need To Wait

But there are still many reasons why AM stations should act as quickly as possible to adopt both NRSC standards.

First, it will immediately alleviate adjacent channel interference on the AM band. Also it sends a

clear message to receiver manufacturers that stations want better fidelity AM radios.

By giving receiver manufacturers guidelines in the form of a deemphasis curve, there's a better chance of having radios built which help AM more effectively compete for today's listeners. NRSC stations on NRSC prototype radios do sound good.

In addition, the FCC has given stations a four-year grace period of "presumptive compliance" to implement NRSC-2 by using NRSC-1 processing.

Right now implementing both portions of the NRSC standard is the easiest way for AM stations to conform to the new ruling.

For the future, the entire NRSC provides AM stations with the best chance of improving the band enough to survive and prosper.

There's no reason to delay.

—RW

the performance of one's duty in the studios.

I'm still very junior in the field but I hope one day I'll make it to the top. I am a technician at our Swaziland broadcast station, have trained in our technical college and am presently upgrading to a higher classification.

Since our country is developing, money is scarce, so we cannot pay for our own training; getting to be a full engineer around here will take some time.

I do studio maintenance on both the English and siSwati broadcast services. Sometimes our cables get eaten by rats and we go off the air. When this happens I suspect I face the same dilemma as many women engineers throughout the world in trying to keep the station working and take care of my husband and children at the same time.

To Tammy, whose marriage ended up on the rocks, I say congratulations that you are putting it behind you, picking up the threads with your new job and are ready to go as high as your skills will take you.

To you, Ms. Editor, if I could be accepted as a charter member of the "Organization of Women Engineers," it would be my privilege to nominate you as our first honorary member!

Dumile Sithole
Swaziland Broadcast Service
Mbabane, Swaziland, Africa

PCB labels explained

Dear RW:

I read with interest the "PCB Rules Cause Confusion" article by Mr. Gatski in the 8 March issue of your journal, as it has certainly caused confusion for us in the capacitor and transformer manufacturing business.

One item in the story could cause your readers some unnecessary expense: in the paragraph that contains trade names for PCB compounds "non-flammable liquid" was given as a name or label. I have

never seen any capacitor marked with this notation but it *could* apply to the fluids used in a great many non-PCB items.

Federal OSHA regulations (29 CFR Ch. XVII, section 1910.106.a.19) define a "flammable liquid" as one that has a flash point *below* 100°F—paint thinner, lighter fluid . . . that sort of thing.

A capacitor that uses good old reliable mineral oil, with a flash point of about 300°F, could be marked "non-flammable liquid" because, under OSHA definitions, it isn't flammable. It would be considered a "Class III B Combustible Liquid" (which is the highest rating that OSHA acknowledges for a liquid with *any* flash point).

Not flammable . . . just combustible. OK. When in doubt, call the manufacturer of the device to see what it contains. It may not need replacement until it expires of its own volition.

Also, to put another comment in the article into perspective: if a device contains 500 parts-per-million of PCB in its fluid, it is treated as pure PCB. Just how much is 500 PPM, you ask? It is equivalent to three shotglasses (4½ fl. oz.) in a 55 gallon barrel of oil. One or two shotglasses and the mixture is just "PCB Contaminated."

And a caveat to anyone purchasing capacitors or transmitters on the surplus market: insist on a *written* guarantee from the dealer that the devices are PCB-Free and know that your supplier has the financial resources to back the guarantee.

William P. Meskan, President
Plastic Capacitors, Inc.
Chicago, IL

Next Issue
RW
May 24

Radio World

Vol 13, No 9

May 10, 1989

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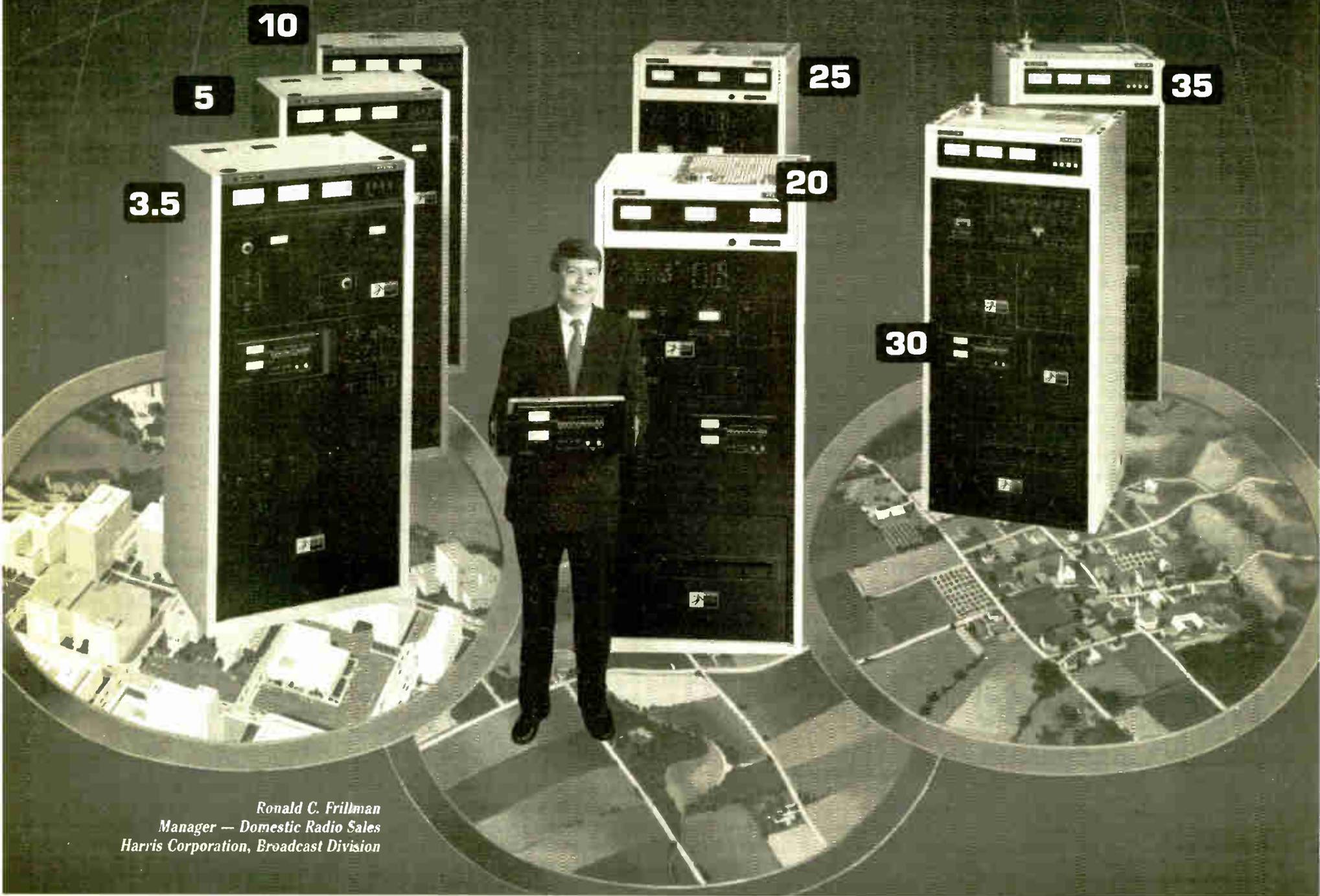


Radio World (ISSN: 0274-8541) is published semimonthly by Industrial Marketing Advisory Services, Inc., 5827 Columbia Pike, Suite 310, Falls Church, VA 22041. Phone: 703-998-7600, Fax: 703-998-2966. Application to mail at second-class postage rates is pending at Falls Church VA 22041 and additional mailing offices. POSTMASTER: Send 3579 forms and address changes to Radio World P.O. Box 1214, Falls Church VA 22041. Copyright 1989 by Industrial Marketing Advisory Services, Inc. All rights reserved.

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NAB Opposes Translator Plan

by Charles Taylor

Washington DC The NAB rejuvenated its objections to the FCC's March 1988 ruling allowing noncommercial educational (NCE) FM translators, and asked the Commission to hold the action until a sweeping translator ruling is adopted.

The April comment was filed in response to the Commission's consideration of a compromise proposal submitted by National Public Radio (NPR) on behalf of five noncommercial groups. Each has supported the NCE ruling, contained in Docket MM 86-112, throughout much of its seven-year struggle to passage.

Those groups—NPR, Moody Bible Institute, Family Stations, the National Federation of Community Broadcasters and the Intercollegiate Broadcasting System—filed the proposal in hopes of resolving consistent conflicts surrounding the issue.

They proposed amending modifications to Part 74 of the Commission's rules regarding translator use by NCE FMs.

The amendment first would require translator applications to show no evidence of harmful interference to existing FM stations and translators.

Applicants also must demonstrate—until 1992—that a requested frequency is not the last available in a given community. The time frame, NPR said, would allow public radio time for expansion.

Provide middle ground

Adoption of the compromise proposal, NPR said in its filing, would provide for "a middle ground between no use of alternative signal delivery for NCE-FM translators and the unconditional authorization of such translators," as adopted in 86-112.

It also is more consistent with the communications policy of localism, a major

concern of the docket's opponents, NPR said.

The proposal also insures that "public radio (will) achieve its goal of reaching unserved and underserved audiences by avoiding the harm which could have been caused by the 1988 alternative signal delivery rule," the organization added.

The NAB responded that the proposed compromise "does recognize and correct some of the obvious failings of the newly revised noncommercial FM translator rules," however, the organization maintained "serious reservations about the policy choices made by the FCC" regarding the rule making.

Foremost, the NAB reiterated its view-

point that no ruling should be enacted until "general and consistent technical standards and overall policy decisions" are reached regarding docket 88-120, which intends to study both noncommercial and commercial translators under one sweeping rule making.

No reason to implement

"With the FCC planning an overhaul of the general rules covering FM translators, there is no reason to implement this proposal now," said NAB FM Translator Subcommittee Chairperson Denise Shoblom. "The Commission should be certain that any new rules would not harm full-service FM

broadcasters."

In its comments, the NAB also complained that the compromise was developed with public stations participating under a degree of duress.

"The compromise was fashioned not on the basis of proposing a modest departure from the rules which existed prior to the adoption—but over concern that those dramatic rule changes simply would become effective (without) a compromise," the NAB said.

The NAB also repeated its concerns that NCE FM translators would operate at the expense of full-service, local FM public commercial stations, both in terms of interference and a lack of local programming from out-of-town translators.

For more information, contact the NAB at 202-429-5350 or National Public Radio at 202-822-2308.

FM Group Scrutinizes Stereo

by Alan Carter

St. Louis MO An FM working group has started evaluating the way stations transmit stereo to determine what protection may be required to reduce interference.

The Composite Spectrum Occupancy Working Group, a division of the FM Subgroup of the National Radio Systems Committee, met in St. Louis recently to outline its course. The result will be a set of recommendations for industry practices.

According to Working Group Chairman Ed Anthony of Broadcast Electronics, at the top of the list of concerns is adjacent channel interference, but in particular second adjacency.

The group will look at how much pilot protection is necessary and examine whether manufacturers are producing adequate filters, he said.

Another topic that will be examined is SCA-to-stereo and stereo-to-SCA crosstalk distortion produced in stereo generation, as well as excessive modulation in

subcarriers. Also, the working group will delve into composite clipping.

To accomplish its goal, Anthony said the group will determine what protection is necessary and then evaluate what practices stations use today are not in line with the group's findings.

Chuck Adams of CRL presented a proposed stereo multiplex mask based on computer modeling of worst case scenarios and FCC limits.

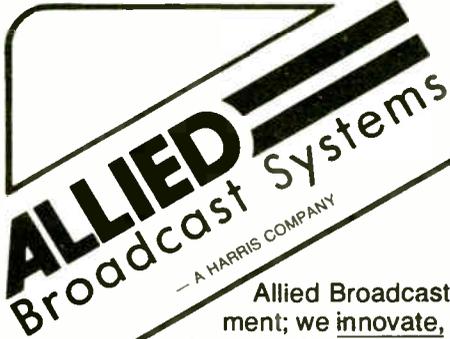
Anthony said there are no FCC rules on pilot protection or SCA crosstalk protection.

tection.

The stereo multiplex mask, or composite spectrum mask, would set compliance limits for stereo generators and excitors, Anthony explained.

Other work the group will consider includes an FM listening study on quality, deleted rules that might still be beneficial and the effects of adding subcarriers to the composite base band.

For information on the working group, contact Ed Anthony at 217-224-9600 or Stan Salek at NAB, 202-429-5391.



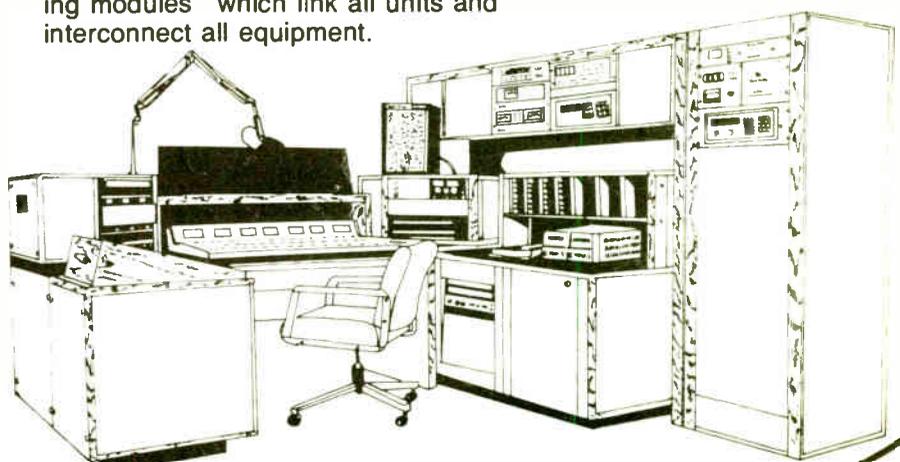
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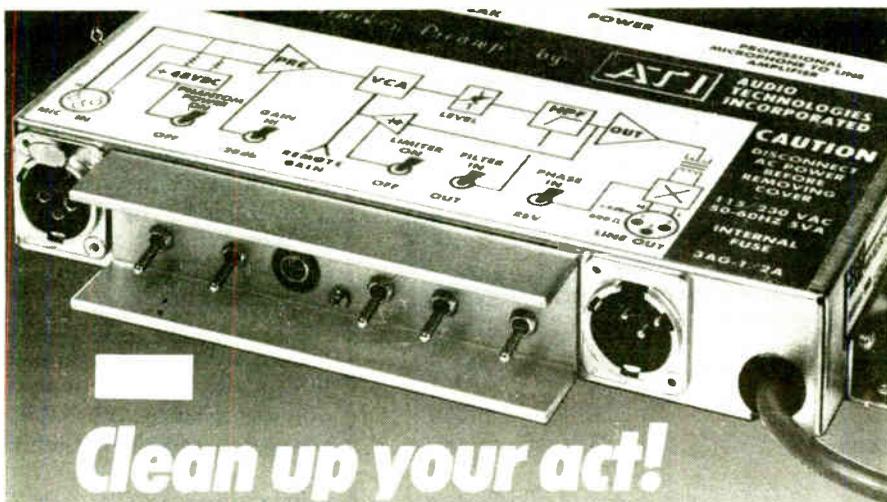
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NRSC-2 Reactions Varied

(continued from page 1)

a station's processing, even though a limit of 75 μ seconds preemphasis for FM stations is already a part of the Commission's rules.

As of 30 June, 1994, stations will be required to establish NRSC-2 compliance through measurements. NRSC-1 is currently used voluntarily by at least 1000 AMs—about 20%—who reported usage to NAB.

The Commission's action said that NRSC-1 alone could not alleviate interference from over-

modulation or transmission system anomalies. Also, it stated that NRSC-1 could be "readily circumvented or abused by adjustments" and that the preemphasis specification of NRSC-1 "restricts the flexibility of licensees" in adjusting processing.

As a compromise, the FCC adopted presumptive compliance, which assumes that any station that has implemented NRSC-1 is in compliance with NRSC-2.

A number of broadcasters agreed that improved AM serv-

ice prompted by NRSC should not only encourage manufacturers, but listeners. A majority, however, said that the band's uphill climb would have been better aided with passage of NRSC-1.

"I feel the part of the proposal allowing presumptive compliance will cause more AM broadcasters to implement the NRSC-1 improvement, which should stimulate the manufacture of wider-band, higher-quality AM receivers," said Art Suberbielle, chairman of the NAB's AM improvement committee.

Understanding the decisions

John Marino, VP of engineering for NewCity Communications, also supported passage of NRSC-1, "though I can certainly understand why the Commission went with NRSC-2. It's an easy thing to measure for the people out in the field doing the measurements at the stations. And I can understand that they feel it encompasses the whole system."

Regarding AM broadcasters, he added, "If they will just realize that it doesn't cost a lot of money and overall it will help get the better receivers out there and prevent interference on the AM band, I think it will certainly help clean up the AM band."

Glynn Walden, AM CE with Group W Radio, however, raised some doubts about the potential effectiveness of presumptive compliance.

"If presumptive compliance is 'bought' by the typical broadcaster—that you have to buy an NRSC-1 processor—then that's fine. But I think that I could

comply with NRSC-2 without buying a processor. I'd probably have to give up preemphasis and maybe keep my modulation as compressed as I possibly could now.

"Since it's not required until 1994, I think most likely people will just violate it until 1994," he said.

Receiver manufacturers

One of the primary questions following passage of the NRSC is whether it will encourage receiver manufacturers to design wideband radios for AM, now that a mandatory standard will reduce adjacent channel interference.

The Electronic Industries Association (EIA), which represents manufacturers worldwide, has demonstrated support of the standard, but remained somewhat noncommittal in response to how it might affect development of an NRSC radio.

George Hanover, EIA engineering director, said it is "hard to say" whether the adopted standard will encourage the widespread manufacture of an NRSC radio.

However, he noted that "receiver manufacturers are going into this with a very positive point of view. I think several of them have already indicated interest and possibly they will pick up and design receivers to the NRSC standard."

Marino said manufacturers are looking more for widespread adoption of the standard by stations than they are the FCC's official nod.

"When manufacturers see the stations in the United States incorporating NRSC-2 and the presumptive compliance of NRSC-1," he said, "I think they will produce the receivers."

Walden said, "I think receiver manufacturers might have had just a little bit more respect for NRSC with 75 μ seconds (of preemphasis) in the rules. I think that would have guaranteed the receivers to some extent, though I'm not so sure we won't get them now."

NAB Science and Technology VP Michael Rau also noted disappointment that the FCC did not include the preemphasis standard because controlling "the shape" of the signal is an important issue in effective radio designs.

But with obtaining the RF mask only, he said AM still will be "a lot better." He encouraged AMs to install filters "as soon as possible."

Manufacturers' viewpoint

For manufacturers of processing equipment, the adoption of an NRSC standard has brought positive response.

"We are contacting a good number of stations that said they were going to wait until something happens (regarding an FCC ruling) and we have very positive feedback from management that they're going to go that way," said Bill Ammons, TV and radio products manager at Circuit Research Labs (CRL), which manufactures NRSC-1 filters.

The company, to date, has sold more than 1000 of its filters, he said.

Officials at Orban, which also manufactures the filter, said they were pulling for passage of NRSC-1, however, the adoption of NRSC-2 has had no negative effect on business. "We have seen a continuous flow of orders since NRSC was announced," said Howard Mullinack, marketing and sales manager.

"For a particular radio station, it offers them nothing. What it does offer is what I call a good neighbor policy, where you do not interfere with your neighbors on the dial and if they adopt NRSC, they will not interfere with you," he said.

At Delta Electronics, whose splatter monitor is effective in measuring RF emissions, "We were pleasantly surprised that the FCC went this far and did not go with the recommendation of the NAB" in requiring only compliance with NRSC-1, said Joe Novak, VP of marketing.

In addition to CRL and Orban, NRSC processing is marketed by Inovonics, Aphex and Energy-Onix.

For more information on NRSC from the FCC, contact James McNally at the FCC, 202-632-9660. Contact NAB Science and Technology at 202-429-5346.

For information on equipment, contact the following: CRL at 602-438-0888; Orban at 415-957-1067; Inovonics at 408-458-0552; Aphex at 818-765-2212; and Energy-Onix at 518-828-1690.

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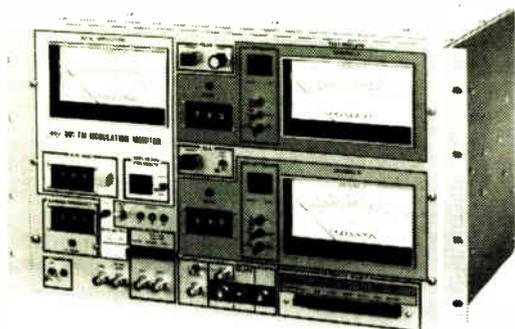
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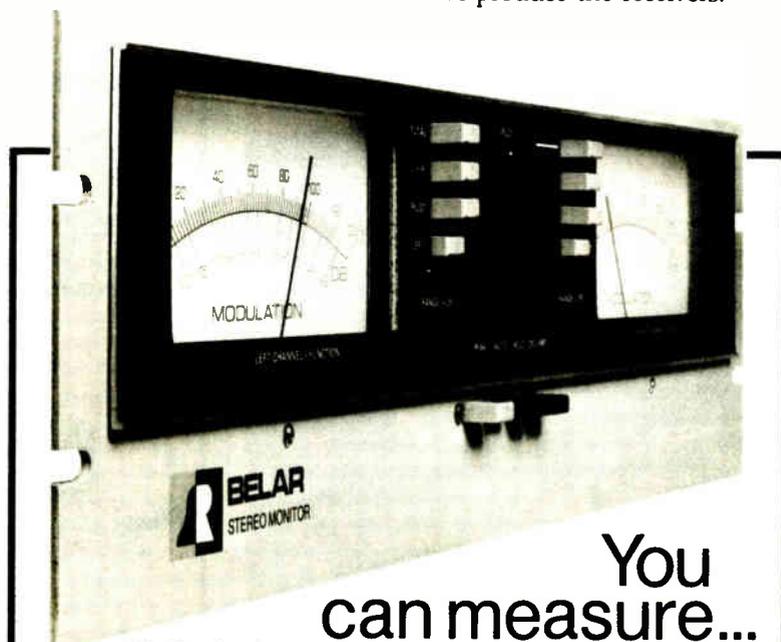
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FM Class A1 Petition Could Aid Daytimers

by John Gatski

Washington DC Another proposal has been put before the FCC designed to help daytime AM stations become more competitive with FM.

And like two similarly-minded plans which came before it—FM2 and the Class A power hike—it also originated in New Jersey.

Several AM station owners said they support a New Jersey consultant's petition for rule making to create a separate FM class that would allow simulcast of AM signals, offering AMs a new selling angle.

Richard Arsenault, a telecommunications consultant from Millville, NJ, filed a petition for rule making 28 March, asking the FCC to create FM

Many station owners said they would like to see the FCC approve the new class.

"It would be dynamite if something like this could happen," said Dave Taylor, owner of WCTR-FM, Chestertown, MD.

He said a simulcast FM signal would allow him to reach more of his community. WCTR is the only station for miles in an area on Maryland's Eastern Shore.

Taylor said his daytime signal is swallowed by skywave interference in the early morning and late afternoon, and the signal suffers from other problems.

"We suffer like everyone else from power line and electrical interference," he said.

According to the A1 proposal, the channel allocation would come from FCC channels 201-300, currently reserved for low-power educational FM stations.

class A1, enabling daytime, standalone AMs to simulcast on FM with 10 W to 1000 W.

According to the FCC, Arsenault's petition is the first one filed requesting the new A1 class.

The proposal asks the Commission to create Class A1 for standalone daytime AM stations only, including those with directional antennas with a horizontal plane of 15 dB or more.

Use Class D space

According to the A1 proposal, the channel allocation would come from FCC channels 201-300, currently reserved for low-power educational FM stations.

Other provisions include: limiting antenna height to 300' and providing a 10 to 11 mile distance to meet the 1mV/m (60 dBu) contour to protect other classes of FM stations.

Arsenault said he wrote the petition on his own time because something needs to be done to reverse the decline of AM.

With skywave interference, signal nulls and other obstacles, AMers cannot serve their communities or compete with FMs for advertising revenue under the current rules, he said.

"There is just a great discrepancy that disturbs me. I just thought it would be in their (AM stations) interest" to file the petition, Arsenault said.

"It (FM simulcast) would certainly make it easier to sell," said WNRK GM and President Al Campagnone in Newark, DE. "The declining AM listenership certainly hinders our ability to sell."

Insufficient daytime power

Campagnone noted that his 1 kW daytime signal and 42 W nighttime signal is not sufficient to cover his potential listening area.

The station has asked for power hikes, but was turned down because of potential interference to other AMs, he said.

"It's like playing the radio sales games with both hands tied," Campagnone added.

Arsenault hopes more AMs will support the petition by writing the FCC to express their opinions.

"The Commission is not going to do anything unless it is publicized," he added.

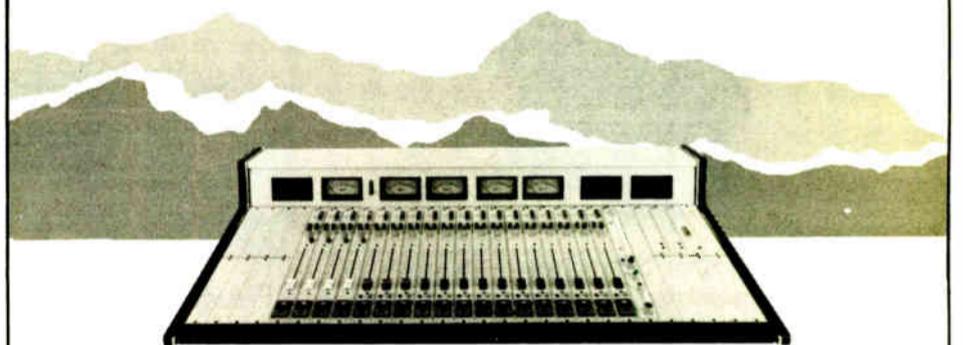
Initial backers are confident other AMs will be supportive.

"I would sure hope that they (other stations) would get behind it," Taylor said.

FCC Engineering Policy Branch Chief James McNally said the Commission could respond to the petition by 15 May.

For more information, contact Richard Arsenault at 609-825-0124, Dave Taylor at 301-778-1530, Al Campagnone at 302-737-5200 and James McNally at the FCC, 202-632-9660.

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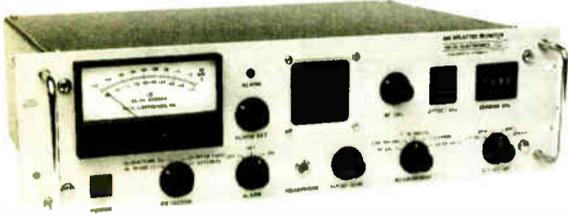
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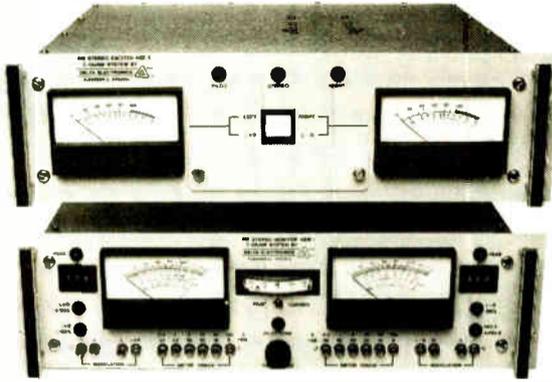
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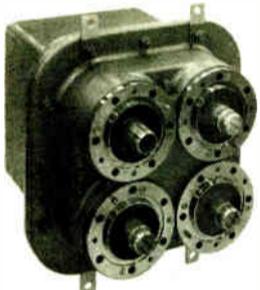
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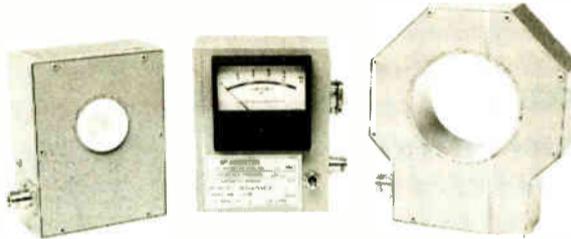
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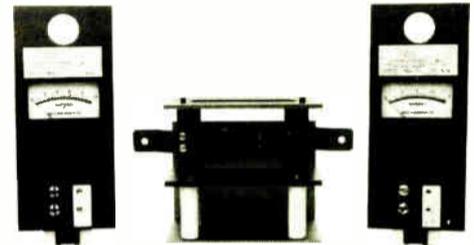
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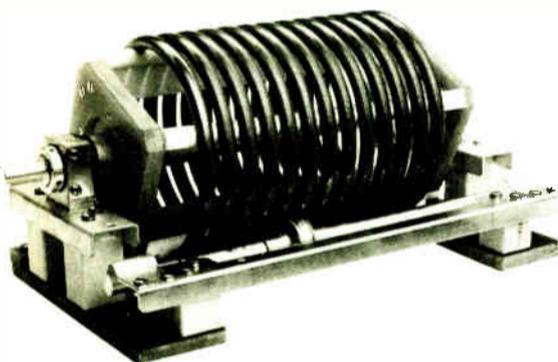
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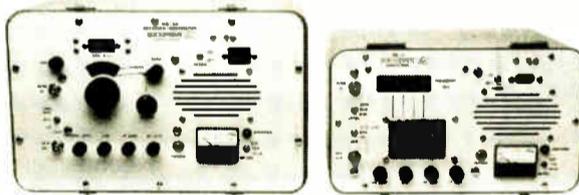
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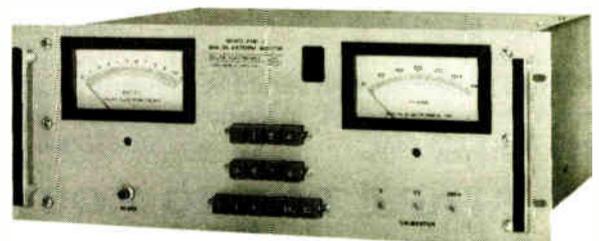
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FM Tower Replaced

(continued from page 1)

The Alford system will cease operation 1 October. A new Shively balanced combiner will be installed late this summer as a replacement, according to Shively Labs.

Although technically advanced for its time, the Alford combiner no longer meets bandwidth needs of today's stations, which also broadcast high frequency subcarriers, according to station engineers.

Stations in New York City first used Alford's innovative combiner in the mid-1960s when several stations began transmitting from an antenna atop the Empire State Building.

Advanced technology

"It (the Chicago combiner) is basically the same style system that is used on the Empire State Building," said Bob Surette, manager of RF engineering at Shively

Labs. "In its day, it was probably the only combiner available that could provide for 10 stations."

According to Surette, the Alford combiner is a "run-out" system with long lengths of coax instead of filters to isolate the transmitters from each other.

The Hancock combiner system transmitters are on the the 93rd and 97th floors. Two of the stations have their studios in the building and simply run their lines a few hundred feet to the transmitters.

The stations that have studios throughout the city and direct suburbs connect to their transmitters via telephone line or microwave link.

FM combiners are not small. The combiner in the Hancock building is housed in two large rooms of the top floor. It takes up as much room as a "railroad car," Larson said.

Huge coax

An 8" diameter coaxial cable connects the combiner to the master FM antenna, located on the west tower, about 70' from the roof. The west tower serves the nine stations and two back-ups.

WBEZ, which will join the new system, and WXRT have separate antennas located on the east tower. Both towers, which are about 354' from the roof, also serve eight TV stations.

The main FM antenna has a 1.3 dB gain from its ten radiator elements, according to Communications Site Management Inc., the management company that maintains the Alford system at the Hancock building.

Surette said the new Shively combiner, which is a "constant-impedance balance combiner," uses 10 band-pass cavities that effectively isolate each transmitter's signal to meet FCC specifications and offer the transparency required for today's FM signal performance requirements.

Each 14'-long module housing the cavity, which will be rack-stacked in two groups of five, are band-pass filters tuned to the frequency of each transmit-

ter, enabling each signal to pass untouched by the others as it travels to the antenna.

Less power needed

Because the antenna height is approximately 1170' high (including the building), the Class B stations operate at much much lower power levels (6 to 16 kW) to obtain the same coverage area as they would with 50 kW at a lower height, Surette said.

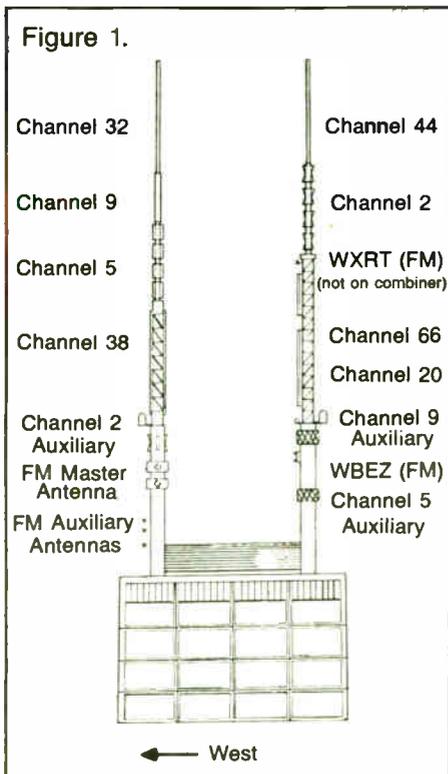
As with the Alford combiner, the Shively unit also will combine the RF energy from 10 FM transmitters and res-

tricted access will be maintained on the roof because the antenna is not being changed, at this time.

Most of the CEs said they don't mind cooperating on a system that allows the programming department to fight out their rating wars from an equal height.

"I think the engineering folks always cooperate more than sales or programming," WKQX CE Joel Hodorff said.

For more information, contact Bob Surette at 207-647-3327, Bob Larson at 312-649-0099, Joel Hodorff at 312-861-7979 or Communications Site Management Inc. at 312-951-1399.



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Standard Oil Bldg	1933	1136
Empire State Building	1931	1250
World Trade Center	1973	1350
Sears Tower	1974	1454



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Up to 150 Class A's Eligible for C3 Relief

by Charles Taylor

Washington DC The FCC's Mass Media Bureau has tentatively identified nearly 150 Class A FM stations that could upgrade to the new C3 class approved by the Commission in March.

The new class was established in Docket MM 88-375 to allow Class A's to expand signal coverage area where a larger C2 station cannot be assigned without interference and a smaller Class A facility is not considered economically feasible, the FCC said. (The FCC is still studying a proposed 3 kW power increase for Class A's in the same docket.)

The Mass Media Bureau derived the list of 150 stations in the hope of side-stepping the time-consuming task of having each station file a petition for an upgrade, which is normal practice, according to Bureau Chief Alex Felker. (See accompanying chart for listing.)

But those on the list are not the only stations that can apply to upgrade, said Jay Jackson of Mass Media. Other stations may qualify if they relocate or change frequencies, he said.

The FCC also expects counter

proposals to be filed, Jackson explained, against some of the 150, from other stations that could upgrade if a station among the 150 were to make a slight change—allowing both to benefit.

"The bureau intends in this limited instance to propose on its own motion upgrades to Class C3 for stations that can upgrade at their present transmitter sites and on their present frequencies," the FCC said in a public notice.

"The bureau believes this approach will conserve the resources of both the Commission and those potential petitioners already identified, and will thereby speed the initiation of improved service to the public."

A formal notice of proposed rule making will be issued, and each upgrade proposal will be assigned a docket number. Comment and reply comment deadlines will also be established.

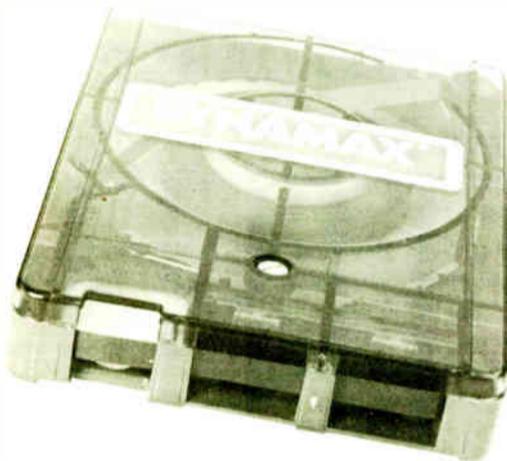
In addition to the 150 proposed station upgrades, Felker said he expects the creation of between 100 and 200 new stations in the C3 class. These stations will be authorized to transmit using up to 25,000 W with an antenna height above average terrain of 328'.

For more information from the Commission, contact Karl Kensinger at 202-634-6530.

Proposed Class A FM Upgrades

KSBS FM	PAGO PAGO, AS	KDBM FM	DILLION, MT
KRBZ	TUSAYAN, AZ	KIDD FM	BEND, OR
KBLJ	LA JUNTA, CO	KFYZ FM	BONHAM, TX
WMMK	DESTIN, FL	KKHQ	ODEM, TX
KOAS	KEALAKEKUA, HI	KPTX	PECOS, TX
WLEW FM	BAD AXE, MI	KRDF FM	SPEARMAN, TX
KOWO FM	WASECA, MN	KARB	PRICE, UT
KRRB	DICKINSON, ND	KERM	TORRINGTON, WY
KATK FM	CARLSBAD, NM	KCBZ	CLARKSVILLE, TX
KWJY	WOODWARD, OK	KVFC	SILVERTON, CO
KWVR FM	ENTERPRISE, OR	WIGM FM	MEDFORD, WI
KORT FM	GRANGEVILLE, ID	NEW	BLACK RIVER FLS, WI
KYZZ	WOLF POINT, MT	KYKD	BETHEL, AK
KBRB FM	AINSWORTH, NE	KWHQ FM	KENAI, AK
KLBN	ALBION, NE	KMTX	KODIAK, AK
KMXQ	SOCORRO, NM	KMMR	MALTA, AK
KQAY FM	TUCUMCARI, NM	KZOQ	MISSOULA, MT
KBXS	ELY, NV	KATQ FM	PLENTYWOOD, MT
KPAH	TONOPAH, NV	KDOT	KIMBALL, NE
KWNA FM	WINNEMUCCA, NV	KWRL	LA GRANDE, OR
KKBS	GUYMON, OK	KICY FM	NOME, AK
KKRS	BURNS, OR	KRJT FM	BOWIE, TX
KGBR	GOLD BEACH, OR	KAKN	NAKNEK, AK
KGFX FM	PIERRE, SD	KFSK	PETERSBURG, AK
KIQZ	RAWLINS, WY	KJCO	YUMA, CO
KDCZ	DELTA JUNCTION, AK	KXPO FM	GRAFTON, ND
KXAZ	PAGE, AZ	KOVC FM	VALLEY CITY, ND
KVWM FM	SHOW LOW, AZ	KFNC	SULPHUR, OK
KALQ FM	ALAMOSA, CO	KIXC FM	QUANAH, TX
NEW	PORT ST. JOE, FL	KSRL	SUTHERLIN, OR
KPOA	LAHAINA, HI	KPEN FM	SOLDATNA, AK
WZRK	HANCOCK, MI	KSTK	WRANGELL, AK
KLAN	GLASGOW, MT	KTNY	LIBBY, MT
KWVG	COLUMBUS, NE	KELY FM	ELY, NV
KBUY FM	RUIDOSO, NM	KACA	PROSSER, WA
KQIK FM	LAKEVIEW, OR	NEW	HUNTINGTON, TX
KROO	BRECKENRIDGE, TX	NEW	BASILE, LA
KBUX	QUARTZSITE, AZ	KHNS	HAINES, AK
KCRE FM	CRESCENT CITY, CA	WAAH	HOUGHTON, MI
KVIB	MAKAWAO, HI	WTKI FM	GULFPORT, MS
KADQ	REXBURG, ID	KRNY	KEARNEY, NE
KYEE	ALAMOGORDO, NM	KWDD FM	WOODWARD, OK
KRTN FM	RATON, NM	KRWA FM	WALDRON, AR
KYXX	OZONA, TX	WQUH	DEFUNIAK SPRINGS, FL
KLRZ	RED OAK, IA	KNDY FM	MARYSVILLE, KS
KLER FM	OROFINO, ID	WGDN FM	GLADWIN, MI
KECH FM	SUN VALLEY, ID	KKEI	IMPERIAL, NE
KKAN FM	PHILLIPSBURG, KS	KOFM	ENID, OK
KOKI	BAYOU VISTA, LA	KRUN FM	BALLINGER, TX
KKBC FM	BAKER, OR	KSUA	COLLEGE, AK
KURY FM	BROOKINGS, OR	KJFP	YAKUTAT, AK
KLXS FM	PIERRE, SD	KNEI FM	WAUKON, IA
KMRE	DUMAS, TX	KNLV FM	ORD, NE
KGHO FM	HOQUIAM, WA	KCMI	TERRYTOWN, NE
KING	FAIRBANKS, AK	KVEZ	SMITHFIELD, UT
KSMK FM	COTTONWOOD, AZ	KVXO	SPOKANE, WA
KKMX FM	HAYDEN, CO	KTOO	JUNEAU, AK
KBMG	HAMILTON, MT	KAWL FM	YORK, NE
KLVM	LEWISTOWN, MT	KDOA	TULIA, TX
KHWY	SANTA ROSA, NM	KWYD FM	SECURITY, CO
KXIT FM	DALHART, TX	KELR FM	CHARITON, IA
KDIU	DIMMITT, TX	KMAV FM	MAYVILLE, ND
KYXS FM	MINERAL WELLS, TX	KSUP FM	JUNEAU, AK
KWCL FM	OAK GROVE, LA	KRQS	PAGOSA SPRINGS, CO
KGVV FM	BEL GRADE, MT	KRJB	ADA, MN
KDRF	DEER LODGE, MT	WMFG FM	HIBBING, MN
KWDG	IDABEL, OK	WNMX	NEWBERRY, SC
KXOX FM	SWEETWATER, TX	KTQN	BELTON, TX
KOPI	MOAB, UT	KPAN FM	HEREFORD, TX
KSPN FM	ASPEN, CO	KLEN	CHEYENNE, WY
KGLM FM	ANACONDA, MT	KOTB	EVANSTON, WY
KSWW	RAYMOND, WA	KCID FM	CALDWELL, ID
NEW	TUBA CITY, AZ	KWLV	MANY, LA
KPOD FM	CRESCENT NORTH, CA	KKDQ	FOSSTON, MN
KUDO	MILTON-FREEWATER, OR	KLSM FM	LOUISVILLE, MS
WMLB	GLEN ARBOR, MI	KSTA FM	COLEMAN, TX
KGUC FM	GUNNISON, CO	KWKQ	GRAHAM, TX
WCMZ FM	SAULT STE. MARIE, MI	KBTB	BETHEL, AK
NEW	BLACKDUCK, MN		

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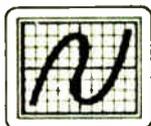
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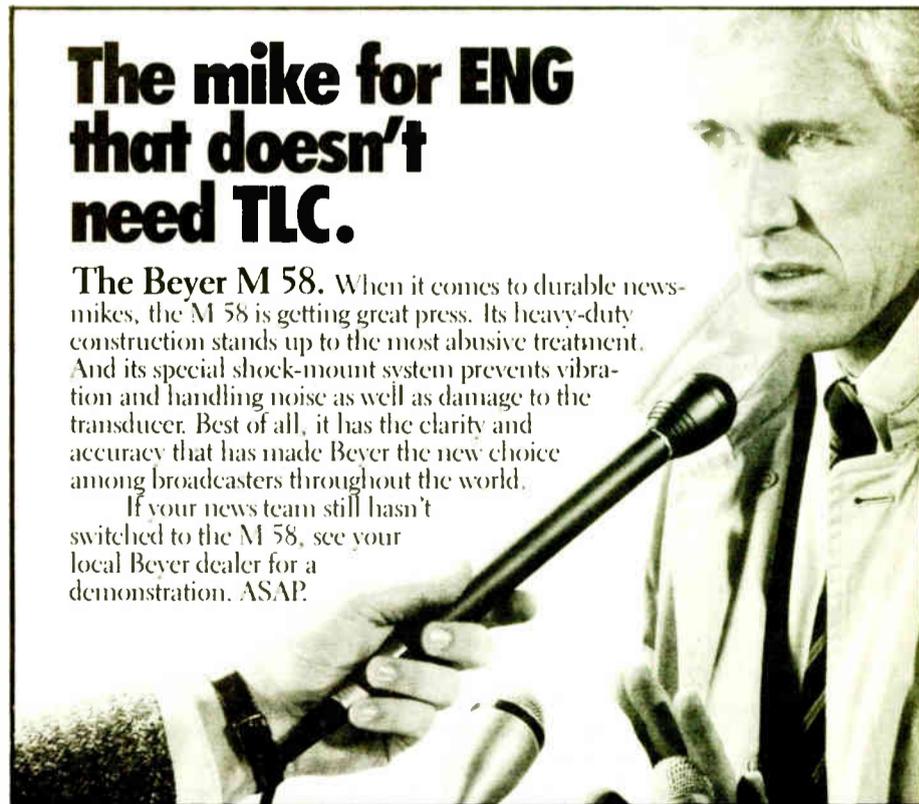
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Human RF Testing Spotlighted at EEPA

by John Gatski

Alexandria VA More money for human research projects is needed to determine safe RF radiation exposure levels, according to speakers at the Electromagnetic Energy Policy Alliance's (EEPA) annual symposium.

Dr. Eleanor Adair, a researcher at the John B. Pierce Foundation, told participants at the 12-14 April conference that scientific research is close to determining exposure limits and effects of RF radiation, but more tests need to be done with human volunteers.

RF radiation is the electromagnetic energy emitted from a broadcast antenna and ranges in frequency from 3 kHz to 300 GHz.

Most RF and other electromagnetic radiation testing has been done on animals, Adair noted.

Human testing

Because of uncertainty of acceptable human exposure levels close to the source, there are no national regulations setting exposure limits.

"What one has to do is find a sympathetic committee" to fund the experiments, Adair said. "If only we could muster the courage to do experiments on

"If only we could muster the courage to do experiments on humans. Only a few studies need to be done to confirm this data."

humans. Only a few studies need to be done to confirm this data."

Some animal research suggests RF radiation from a variety of sources, including radio and TV transmitters, can cause a warming of the body.

She said, however, that funding for human RF experiments is difficult to secure, perhaps because of uncertainty about radiation's effects.

Adair conducted some RF research on herself with little effect other than sweating, she said.

Other animal studies and some human tests in Europe, Asia and America have suggested non-thermal effects associated with RF radiation, including "calcium efflux," a release of extra calcium ions from the brain, according to a recent FCC RF bulletin.

Animal testing

Dr. Christopher Gordon, a researcher at the Environmental Protection Agency (EPA), said that because most research with RF and other electromagnetic energy is conducted on lab animals, it's difficult to "extrapolate" results for human comparison.

The EPA last fall stopped work on national standards when it shifted funding to other areas, a move the EEPA

opposed.

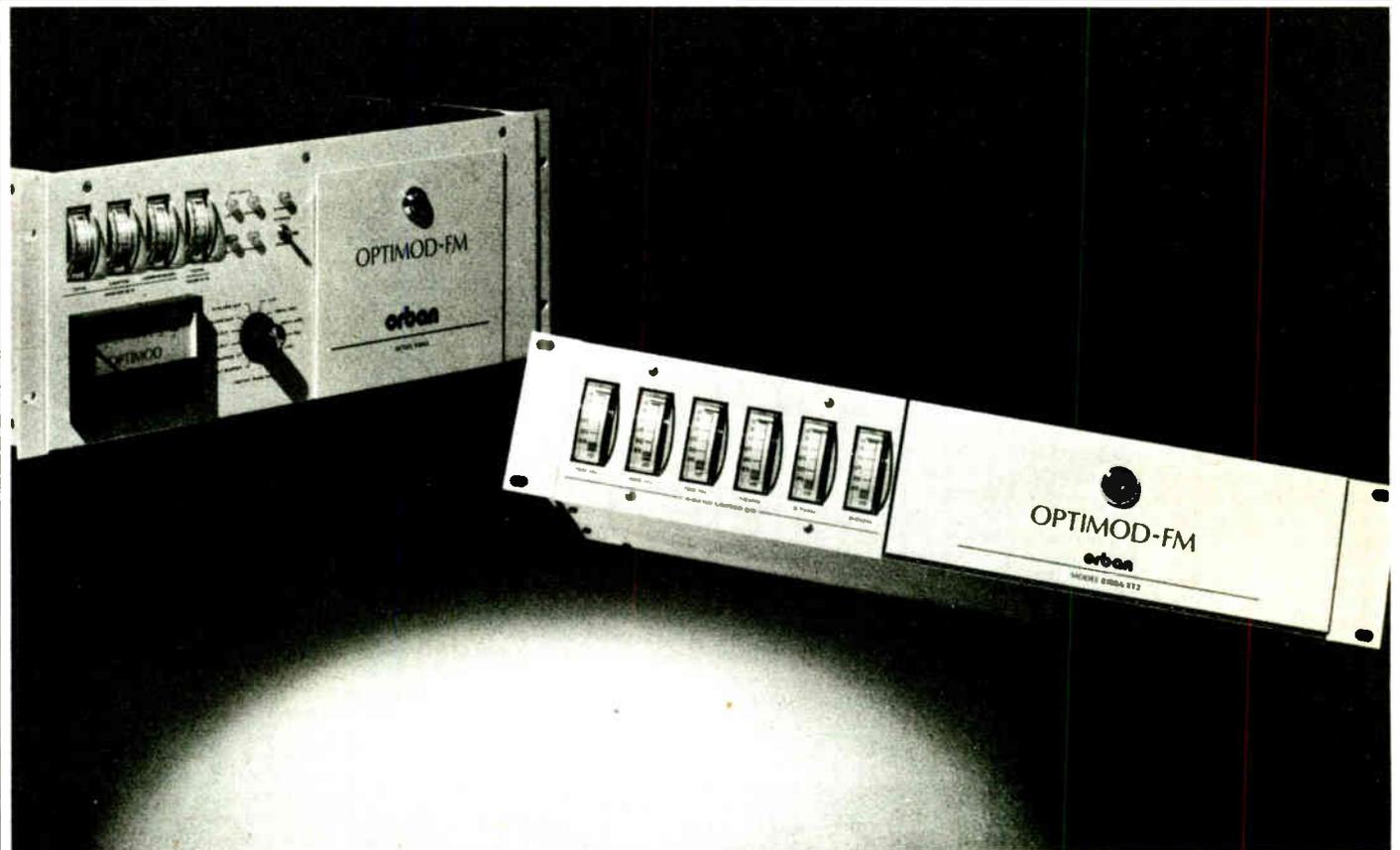
In 1982, the American National Standards Institute (ANSI) developed an absorption safety guideline of 4 W/kg body weight, but that is only a suggested level, not a requirement.

Other speakers at the symposium addressed related RF exposure issues.

In addressing broadcasters' liability
(continued on page 18)



Dr. Eleanor Adair (right) calls for more RF testing, during the EEPA's annual symposium.



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Harrison Bought by GLW Enterprises

by Charles Taylor

Nashville TN The assets of Harrison Systems Inc., a manufacturer of broadcast consoles, have been purchased by a group of former Harrison principals and outside investors after the company defaulted on its primary loan agreement.

Harrison's assets were acquired by GLW Enterprises Inc., from the company's primary lender, First American Bank of Nashville, after the bank placed a lien on the company's equipment inventory, fixtures, accounts receivable and intangibles, according to Harrison's attorney Kin Cosner.

"There were insufficient funds to bring that loan current and accordingly, the bank foreclosed on the accounts," he said. "Some, but not all of the principals of Harrison, with some outside investors, then elected to make an offer to the bank to purchase the assets for their fair market value."

The deal was consummated around the middle of April, Cosner said.

According to GLW President William

Owen, the company will manufacture Harrison's former line of consoles, retaining its facilities and "the majority" of its employees.

"We will absolutely be developing new products under the Harrison and/or the GLW name. We have not determined at this point which way, but we feel the Harrison name has value and we intend to retain that name and use it," Owen said.

"At the same time, we feel that the GLW name will have value and we intend to use that name also, but the future will determine what combination" of the names, he added.

The company also is providing service and maintenance for existing Harrison customers, according to Owen.

One of Harrison's more widely publicized contracts was to design and manufacture custom consoles for Voice of America. Though the project was beleaguered with internal delays, Owen said it had no effect on Harrison's demise.

The only Harrison Systems principal to hold an equity interest in GLW is Owen. David Harrison and Tom Piper, formerly Harrison heads, will remain employed by GLW, according to a GLW-issued press release.

"My efforts for GLW will be focused

solely on providing engineering and other technical services, and I am not involved in either the ownership or management of GLW," said Harrison in the release. "This will allow me time to focus my efforts on the technical areas that I enjoy, as well as allowing me time for personal activities."

GLW's sales department will be headed by David Purple, Martin Burns and Brad Harrison. The company currently is kicking off a sales and marketing plan and will be adding additional personnel in the near future, Owen said.

For more information on the company, call 615-331-8800.

Carillon Puts dbx On Block

by Charles Taylor

Sunnyvale CA After only eight months under new ownership, the professional products division of dbx Inc., a manufacturer of noise reduction systems, was expected to be sold this month to an established broadcast products company, according to Jacques Robinson, president of Carillon Technology, its parent company.

Robinson would not cite companies with which dbx was negotiating, though he indicated it would likely be a company that includes more of a focus on commercial products.

"We're (Carillon) primarily a consumer company and we felt it's in the long-term interest of dbx to be positioned within a group that serves that market with a lot more understanding than we can," he said.

The sale of dbx will mark an end to Carillon's frustrating struggle to bring the company back to profitability since purchasing it last August.

The company's president, Michael Kelley, resigned at the end of February, leaving dbx without an official head until April, when Jerome Werner was named to the position.

Meanwhile, murmurs circulated in the marketplace about delays with product orders and high turnover among the sales staff.

"We had ordered dbx Type II noise reduction equipment, and we waited and waited and it didn't come," said Art Reis with Satellite Music Network, which relies heavily on the dbx devices.

The company's buyer would "contact a person at dbx and they'd say they'd look into it, and we'd try to reach the

(continued on page 18)

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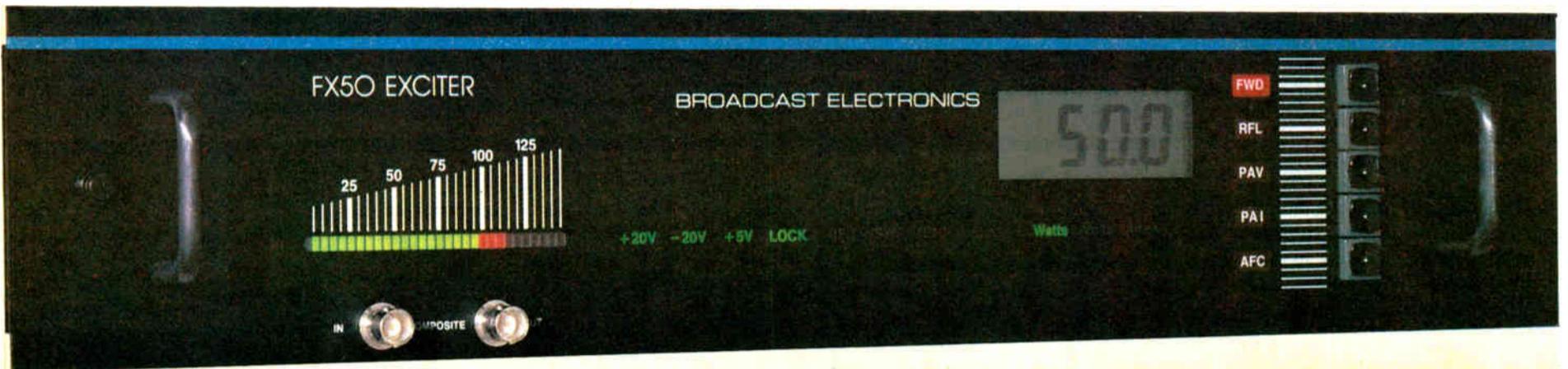
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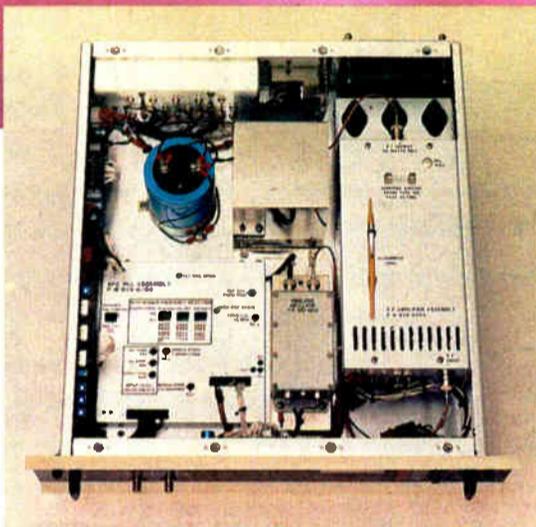
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Pirate Radio: Loud to the Limit

(continued from page 1)

reveal the equipment, however.

KQLZ audio consultant Frank Foti, president of Cutting Edge Technologies in Lakewood, OH, a friend of Shannon's who worked with him in New York at WHTZ, would say only that the chain includes a new filtering process that cleans up interference from the main channel to the SCA and eliminates harmonic products.

The filter, he explained, returns a 1/2 dB modulation dividend to the station.

Foti had no comment when asked if the KQLZ audio chain includes the "Vigilante" Multiband Limiter, a product of his company.

KQLZ GM Simon T stated he'd never heard of the Vigilante and added that

"bringing AM to FM. Thank goodness they are using filtering in the audio."

Kanner said the clipping creates distortion. He said this processing is "playing with destruction of the (FM) medium itself."

Blodgett said there is a stress level in the sound that he does not like.

"It is an actual physical sensation," he said. "It is a piercing harshness. It feels better to get away from them."

Callaghan said he does not like the reverb on the mic.

Behind the sound

But the souped-up processing isn't the whole story. There's also format.

KQLZ calls itself "Pirate Radio." Masquerading as an edgy, hip outlaw pi-

who reportedly could make as much as \$15 million in his deal with Westwood as a VP and KQLZ programmer.

Attempts to reach him for comments on the format were unsuccessful. But in a statement, he called Pirate Radio "free-form rock'n'roll for the '90s."

"This is the logical evolution of CHR designed for and aimed directly at the

"It's best that the rest of the LA market guess what's in those racks."

16-to-30-year-old listeners who find the current Los Angeles CHR stations too 'dancy' and the AOR stations too 'old,'" he said.

Westwood One President Norman Pattiz was obviously struck with Shan-

non's pitch.

"I think we're on to something here, and I think the term 'Pirate Radio' is going to be one that works extremely well here, and we're very anxious to see how we can take it beyond Los Angeles," Pattiz said.

Pirate Radio, and the image the term conjures up, is a positioning statement for KQLZ, Pattiz said.

The image dates back more than 20 years when ships in the North Sea broadcast rock'n'roll to the British Isles from international waters out of British government jurisdiction.

"It has a renegade quality to it," Pattiz said. "It has an attitude, and that attitude can exist regardless of the specific playlist."

Westwood One intended to put the format on satellite for about a week for interested stations to check out. Pattiz said Westwood One could make it available throughout the country.

Pirate Radio in everyone's backyard? It could give a whole new dimension to the dreaded modulation wars.

♦ ♦ ♦

West Coast Correspondent Frank Beacham contributed to this article.



KQLZ PD Scott Shannon stands at the helm of his Pirate Radio station's console.

any product in the chain is confidential information.

Asked about concerns of overmodulation, T said, "Overmodulation would be illegal."

Forti said KQLZ is legally modulated. As for what's in the audio chain, he said, "It's best that the rest of the LA market guess what's in those racks."

What's heard

KQLZ's competitors may be trying to guess just that, but overall, they aren't that impressed with the sound the station produces.

Koza said he hears artifacts and holes in the audio. He described the sound as

rate radio station, Westwood One switched the station's call letters from KIQQ, and on 17 March only hours after inking a \$56 million deal with Outlet Communications, began broadcasting, initially from a makeshift warehouse control room.

Initial promotions had an edgy quality with brief snippets of noise and static often added to give the illusion the broadcast was beamed into LA from a mysterious outlaw outpost.

The music mix includes some oldies, dance music and heavy metal with primary emphasis on Billboard's Top 100 singles.

Pirate Radio is the doing of Shannon,

Part 15 Rules Tightened

by John Gatski

Washington DC A change in FCC regulations allowing more use of broadcast frequencies for non-broadcast utilities could help RF interference to AM stations.

The NAB had not decided whether to oppose recent FCC revisions of Part 15 Rules, including a provision that allows unlicensed devices such as remote control garage door openers and shoplifting sensors to operate on more commercial broadcasting frequencies.

Although such devices will be allowed to operate on more frequencies, the FCC said the revisions adopted in late March also will require manufacturers of non-intentional RF emitters, such as computers, to tighten emission standards, which can help reduce AM radio interference.

When the FCC began considering changes to Part 15 in 1988, NAB warned the Commission it would oppose any changes if they resulted in more interference to radio or TV frequencies.

According to NAB Staff Engineer Kelly Williams, the association had not taken

a position on the changes because the specific frequencies and specifications—including the more stringent emissions standards—were not available. They will be listed in a forthcoming report and order.

The Commission determined that the old "design specific" approach to frequency assignment and interference specifications for non-licensed devices became outdated as technological improvements were made.

In addition to tightening non-emitter specifications, the Commission banned Part 15-covered devices from operating on certain radio frequencies that are very sensitive to interference.

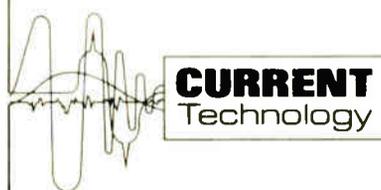
Also, no new devices will be permitted to operate on TV frequencies, pending development of HDTV production and transmission standards, the FCC said.

The FCC said it will allow an ample grace period for manufacturers to continue making non-emitting devices under the old standards in order to offset any hardship caused by stricter requirements.

For information from the NAB contact Kelly Williams at 202-429-5346, or call John Reed at the FCC, 202-653-7313.

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NY Competitors Share WNEW

by Alan Carter

New York NY Westwood One and Metropolitan Broadcasting have closed a deal for joint ownership of WNEW-AM with Westwood operating the facility.

This puts an interesting twist on the New York City market with two competing groups owning one AM station

while each will have a separate FM in the same market.

Metropolitan also owns WNEW-FM while Westwood has an application pending on WQHT-FM—the former Emmis station before the "great switch" last fall.

Westwood and Metropolitan announced a tentative agreement in June 1988 and closed 7 April on the pact val-

ued at \$11 million by which Westwood obtained 50% and operating control of WNEW-AM; the remainder of the company is owned by a Metropolitan holding company.

The FCC on 27 March overruled an objection filed by a listener who complained about a proposed format change as "against public policy."

The Commission stated that it does not review format changes because such a review "does not advance public welfare, poses substantial administrative problems and would deter innovation in radio programming." Formats are

"left to market forces," the FCC concluded.

In addition, the objection questioned possible violation of multiple ownership rules, citing a "substantial degree" of media diversification. The Commission noted the deal between Westwood and Metropolitan also is not applicable to multiple ownership.

The FCC said 22 FMs and 17 AMs are licensed to New York City, as well as "many others" with signals over the city. The agency also noted that 11 TV stations are licensed to or serve New York City.

Carillon Divests of dbx

(continued from page 15)

person the next week and find the person was no longer there. This happened two or three times," Reis said.

Robinson conceded there have been problems. "As we have gone through streamlining the company and managing it more effectively, there have been spot shortages in the product line and so there have been supply interruptions," he said, adding, "They're not permanent in nature and we haven't been discontinuing any of the pro product line."

He attributed the delays to "serious belt tightening, a function of the fact that last year when we acquired the company, we took a number of measures to get the company to profitability quite quickly.

"One of the things we did was to increase the prices on quite a number of the products," Robinson said. As a result, the company's sales force recommended substantially reducing production plans.

What in fact happened is that sales did

not go down. They escalated, according to Robinson.

When the marketplace saw the company's deliberate measures to get the company on its feet again, "it was viewed as a healthy sign and more people were willing to commit to our products."

But the company was not prepared to keep up with the demand.

Now, said Robinson, "We're taking efforts to restore that, but at the same time we're in sales negotiations with a new buyer. The buyers are obviously all extremely concerned about the shortage situation and all planning to move very rapidly to restore the (product line). As far as manufacturing, we're going to be here to help that process, too. We've got our customers to take care of."

Shortages may continue through June, he said, because it takes that long to acquire materials.

For information, call dbx at 617-964-3210 or Carillon at 408-749-8400.

EEPA Addresses Testing

(continued from page 13)

implications, attorney Thomas Watson said there is an indication that they may face more litigation in the near future as a result of RF health injury claims.

His law firm, Cowell and Moring of Washington, DC, specializes in scientific and technological phenomenon litigation.

Watson said the broadcast industry may be at a point where the electric power industry was several years ago.

"There has not been a rise of tort suits yet, but the comparisons are being made with the power industry," he said.

Watson said numerous suits have been filed against power companies, ranging

in magnitude from health injuries supposedly caused by power line magnetic fields to negative impact on property values.

In commenting on the RF standards issue, Watson said any mandatory guidelines would not immunize broadcasters from damage claims.

"On one hand, standards are a comfort feature, but just because you meet a government standard, doesn't mean you are protected from litigation," he said.

The EEPA endorses a government RF standard because it fears a local regulation-phobia could result from adverse RF exposure publicity.

For information on RF radiation from the EEPA, contact Dick Ekfelt at 202-452-1070.

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A Poor Man's Distribution Amp

by John Shepler

Rockford IL OK, you've got a production studio full of cart machines, tape recorders, phone hybrids, patch bays and even a cassette machine or two. In the center of it all is a new control board with stereo program and audition outputs. Now, how do you drive all of that equipment from the board?

Some stations use a switching arrangement. One of the first stations I worked for had a rotary switch installed on the board's program output. You had to choose whether to feed the input to the cart recorder, reel recorder, telephone or the patch panel in the transmitter room.

if the board output goes to a patch panel, which is then normaled to the loads. When you plug in a patch cord to check the board response and distortion, it breaks the connection to the heavy loads, and everything measures just fine. A better test method is to unplug one of the recorders and feed the distortion meter from that connection.

Many stations have solved this problem by using distribution amplifiers. A distribution amp, or DA, has a single input with a level pot and six or more outputs.

Each output is driven by its own power amp, which is similar to the output amplifier in the control board. Since the amplifiers are independent of each other, a short on one amp's output will go unnoticed by the others.

Sometimes the amplifiers have their

The first small problem is simply that adding another amplifier to your audio chain just takes you one more step from that ideal straight wire. Any active device can only add noise and distortion of its own.

Of course, you already have many op-amps in the board and certainly a few in the recorders. So, for most stations, a high quality DA won't add any coloring you can hear.

There is also an advantage in having something to isolate your board from such potential nasties as phone lines that get hit by lightning, or inter-studio lines that some unsuspecting engineer might short while trying to wire up something else down the hall.

The second small problem is that any device you add to the chain is one more

ready have encountered. Distribution amplifiers aren't cheap. We're talking several hundred to several thousand dollars to get the job done. No problem if they're in the budget. But what if they're not?

Hurdling the cost obstacle

I've found a reasonable compromise that seems to work for most stations. If you have a budget problem, I'm sure it will work for you.

The solution is nothing more than a fancied-up bridging circuit. Bridging
(continued on page 32)

Q-TIPS

That's pretty inconvenient. Nobody wants to lose valuable production time just because they forgot to select the correct recorder.

All of the record input should be active all of the time. That way, you don't have to worry about throwing switches to get the job done.

Just as importantly, you can do special effects such as using a recorder as an echo chamber, by feeding the playback into the mix at a low level.

Avoiding overdriving

The obvious answer is to simply connect any and all record inputs and other feeds to the output amp of the board. I ran into this at another station where the board audio seemed to be distorting.

Sure enough, half a dozen inputs were wired to the output terminal block. Each input was a standard broadcast value of 600 ohms. The board level had been cranked up so the meters looked OK. But the poor output amp had been driven into clipping.

By the way, this situation can fool you

own gain adjustments and even resistive pads to mimic the board output of +4 or +8 dBm at 600 ohms.

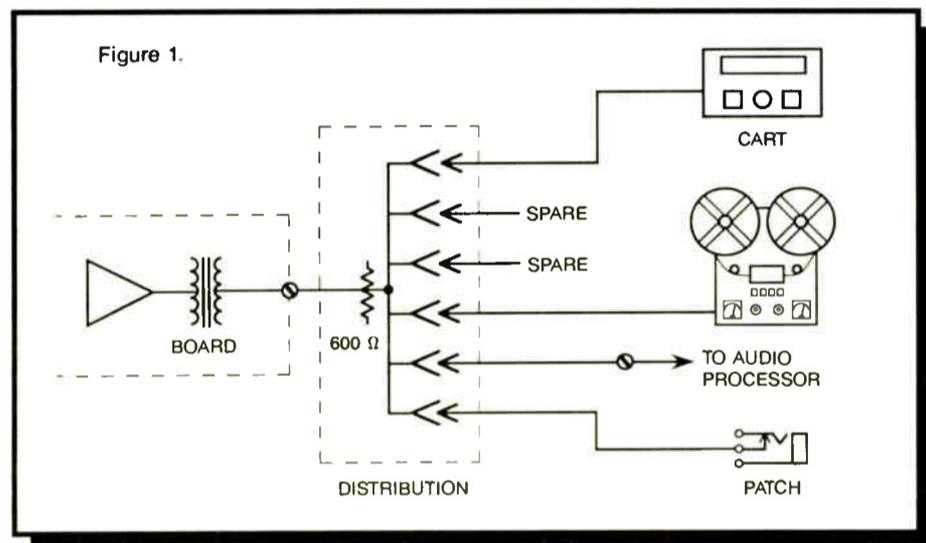
Some problems

A lot of big stations, especially TV stations, have racks full of distribution amps and swear by them. There are, however, two small problems and one big one that you should be aware of.

thing to go wrong. If a DA goes down, like one did during a presidential debate, the air goes quiet for a while.

But actually, a good DA is probably as likely to stay running as your board is, and more likely than most transmitters. A simple patch-around or switch-around arrangement will protect you from not being able to put a studio on the air.

The big problem is one you may al-



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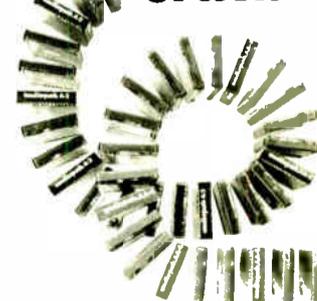


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Solid State Diode Operation

This is the third installment in a 12-part series called *An Introduction to Active Devices*, a home-study course on the fundamentals of electronic component operation.

Northern Virginia Community College is offering continuing education credit to readers who have registered and successfully completed an examination at the end of this series. To register, contact the Director of Continuing Education, Annandale Campus, 8333 Little River Turnpike, Annandale, VA 22003, or call 703-323-3159. The fee for the course is \$20.00.

by Ed Montgomery

Part III of XII

Annandale VA Lesson 2 introduced the concept of solid state operation through the activity that took place in a crystal containing positive and negative material, or ions. We examined the creation of a solid state PN junction. Such a junction can also be called a diode.

The term diode is a carry-over from the time of vacuum tubes in electronics, when two elements were required to make the device work. Figure 1 is a

Ed Montgomery currently is an electronics teacher at Thomas A. Edison High School in Fairfax County, VA. He has taught broadcast engineering at Northern Virginia Community College and has worked as a broadcast engineer for several radio stations.

schematic diagram of a diode.

It is important to know the meaning of terms when placing the device in proper operation. The cases diodes come in vary from different manufacturers. Figure 2 illustrates how to determine the anode or positive side of the device.

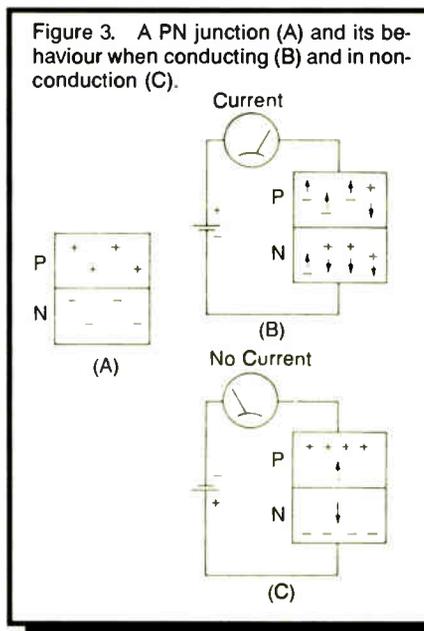
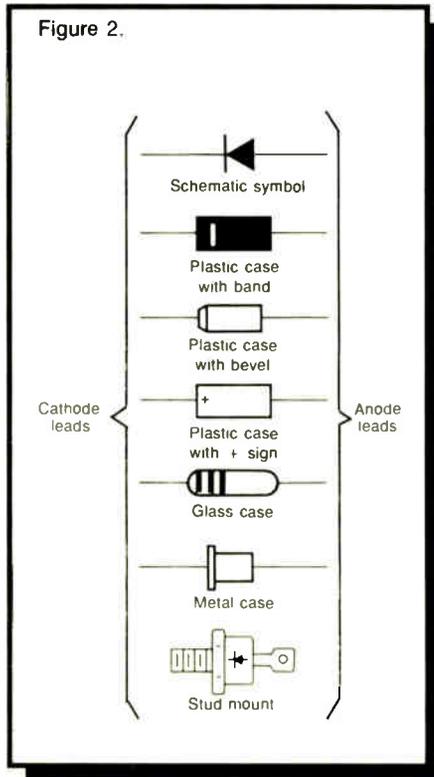
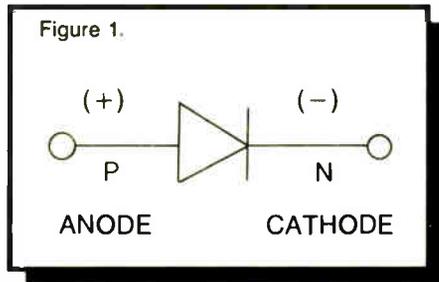
Anode and cathode sides of a diode can also be determined with an ohmmeter.

When forward biased, the meter will measure a very low resistance. Reverse biasing the device with the meter will result in a very high or infinite resistance. If no difference in resistance can be determined, then the junction is bad.

Junction and point-contact

Diodes can be classified into two main groups: junction diodes and point-contact diodes. Junction diodes are used in DC through microwave applications; point-contact diodes are primarily used in radio frequency applications.

Diodes are not perfect devices. When



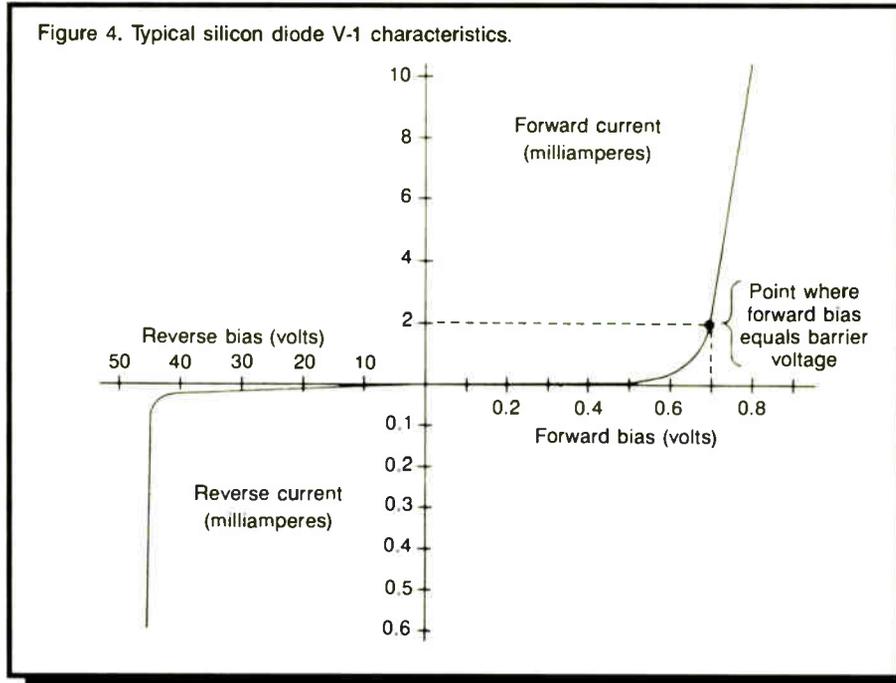
is applied.

When the device is forward biased, current only begins to flow when the barrier potential of the junction is overcome at point A. When reverse biased, a very small amount of leakage current flows until the junction breaks down at point B.

Both silicon and germanium diodes can be damaged with excessive forward current or reverse current. It is important to

(continued on page 37)

voltage is applied to the junction, current will not flow immediately. Figure 4 illustrates what happens when voltage





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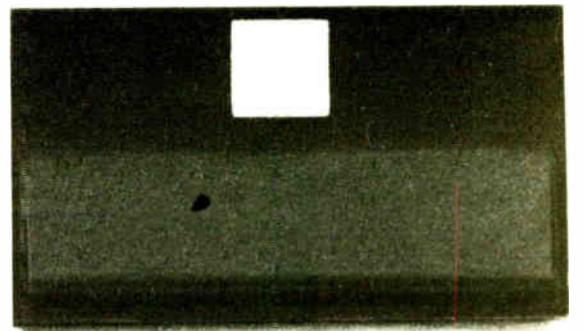
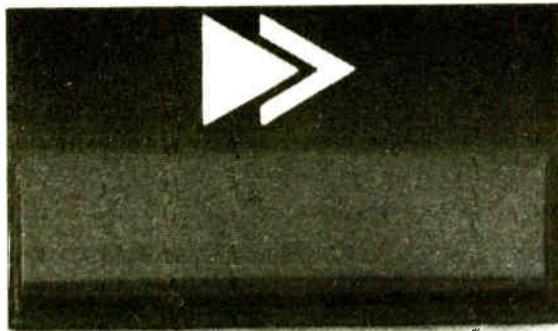
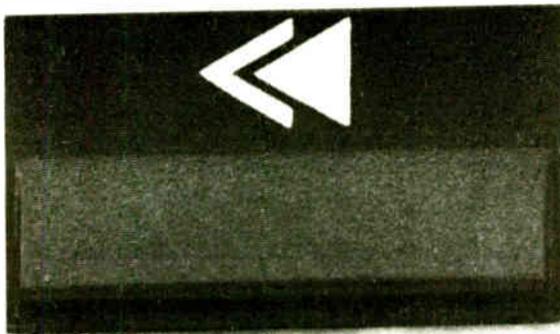




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Assembling Your MIDI Studio

by Bruce Bartlett

Ekhart IN You can compose and record music for promos, news intros and commercials in your own facility with a personal MIDI studio.

This is something like a personal multitrack recording system, but with two important differences: most of the musical instruments you record are synthesized rather than live and you play them all yourself on a keyboard.

Typical equipment in this studio includes a synthesizer, a drum machine, a sequencer (performance recorder) and a cassette recorder/mixer.

The system for interconnecting this equipment is called MIDI, which stands for Musical Instrument Digital Interface. MIDI allows the devices to communicate with and control each other through standard MIDI cables.

MIDI does not send audio from one piece of equipment to another. Rather, it sends copies of the gestures performed on a keyboard—note on/off, note number, patch or sound number, etc. The MIDI signal itself is a digital bit stream running at 31.25 kilobaud.

MIDI nuts and bolts

Basically, when recording with a MIDI studio, you play music on one or more keyboard-style instruments (a synthesizer or sampling keyboard) and record your performance gestures with a device called a sequencer.

Drum patterns are composed on a drum machine and recorded with the machine's built-in sequencer. You then record vocals or other microphone recordings onto a tape recorder while simultaneously playing back the drum-machine patterns, sequencer recording and tape recording through a mixer.

A sync tone on tape keeps all the instruments synchronized so they sound like a band playing.

The sequencer in this system permits

extraordinary control of your music. For example, you can fix wrong notes, change tempo without changing pitch, record a performance one note at a time, copy or rearrange song sections and change synthesizer sounds after the performance is recorded.

Equipment

One of the main pieces of equipment in a small MIDI studio is the synthesizer, a keyboard electronic musical instrument that creates sounds electronically with oscillators. Your studio might have more than one of these.

LINE OUT

Synthesizers can be either monophonic or polyphonic (multi-timbral). A multi-timbral synthesizer can play two or more patches at once. A patch is a sound preset (an instrumental timbre), such as a synthesized piano, bass, snare drum, etc.

A more recent innovation for the MIDI studio is a sampler, which records short sound events—samples—into computer memory. A sample is a digital recording of one note of a real sound source: a flute note, a bass pluck, a drum hit, etc.

Often a sampler is built into a sample-playing keyboard, which resembles an electronic piano and contains samples of several different musical instruments. When you play on the keyboard, the sample notes are heard. The higher the key you press, the higher the pitch of the reproduced sample.

Another basic piece of MIDI studio equipment is the drum machine, which plays built-in samples of all the sounds of a drum set, as well as other percussion such as cowbells or handclaps. It also records and plays back drum patterns that you program with built-in keys

or drum.

To capture your musical ideas you will require a sequencer, a device that records performance gestures (such as keypresses on a piano-style keyboard) into computer memory.

Unlike a tape recorder, a sequencer does not record audio. Instead, it records the key number of each note you play, note-on signals, note-off signals and other parameters.

The sequencer can be a standalone unit, a circuit built into a keyboard instrument or a computer running a sequencer program. Like a multitrack tape recorder, a sequencer can record eight or more tracks, where each track contains a performance of a different instrument.

A power amplifier and speakers, or powered speakers, are also a necessity. Used for monitoring, these speakers should be set up in a near field arrange-

ment (about three feet apart and three feet from you).

128, Atari ST, Apple Macintosh, IBM PC and Yamaha C1 Music Computer. This last unit is an IBM-compatible portable unit with MIDI and SMPTE connectors.

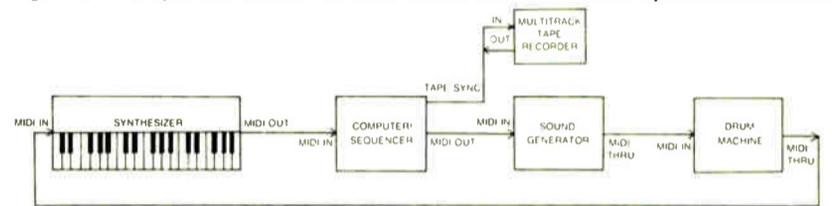
Another option is a MIDI computer interface, which plugs into a user port in your computer and converts MIDI signals into computer signals and vice versa. You need this only if you're using a computer in your system.

A combination mixer and cassette recorder to record vocals and acoustic instruments might also be worth considering as an option (this was covered in detail in a previous issue). A more elaborate studio might use a separate mixer and eight-track recorder, which can be open-reel or cassette.

Tape synchronizers are also optional. These devices synchronize tape tracks with sequencer tracks and make the sequencer start at the same place in the song that you start the tape.

If you have two or more synthesizers, or a synth and a drum machine, you need a mixer to combine their audio out-

Figure 1. A simple MIDI studio. The audio cables, mixer and monitor speakers are not shown.



Some optional devices

As an option, you may consider a personal computer system with disk drive, monitor and perhaps a printer. The computer is used mainly to run a sequencer program (which would replace the sequencer). Compared to a standalone sequencer with an LCD screen, the computer monitor screen displays much more information at a glance.

The computer also runs other useful programs. A librarian program manipulates patches or samples and stores them on computer disks. An editor program also lets you create your own patches. A notation program converts your performance to standard musical notation and prints it.

Some popular computers for music composing are the Commodore 64 and

puts into a single stereo signal. Also, a two-track machine to record the stereo mix of all your sound sources is desirable. The tape made on this recorder—open reel or DAT—is the final product.

You may also consider purchasing some signal processors such as reverb, echo or chorus to add sonic interest or spaciousness.

Odds and ends

To keep all this equipment in order, consider investing in an equipment stand. This system of tubes, rods, and platforms supports all your equipment in a convenient arrangement. It provides user comfort, shorter cable lengths, and more floor area for other activities.

Cables are another item to add to your studio setup. Audio cables are usually phone-to-phone. MIDI cables, which carry MIDI signals and have a five-pin

(continued on page 30)

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Sightless CEs Share AM Vision

by Dee McVicker

Tempe AZ Colin "Cole" Malcolm has never seen his station's transmitter, although he's fixed it plenty of times. Malcolm has never seen Jim Stargel either, although he has called Jim often to discuss transmitters, market share, programming and whatever else legally blind radio entrepreneurs talk about.

Some might call it the blind leading the blind, but those that know Malcolm and Stargel know otherwise. Their stations, both small market AMs, are exam-

OFFBEAT RADIO

ples of determination, good engineering, business savvy and perhaps a bit of "blind faith."

Of the two, Stargel has the advantage of some working sight in one eye. Although it's not much—only a fuzzy recognition of color and shape—Stargel finds his way around KMJY's studio and transmitter without much problem. Ev-

gineer bounding up a tower or checking the modulator plate current in a transmitter. And yet Malcolm and Stargel do these things and more.

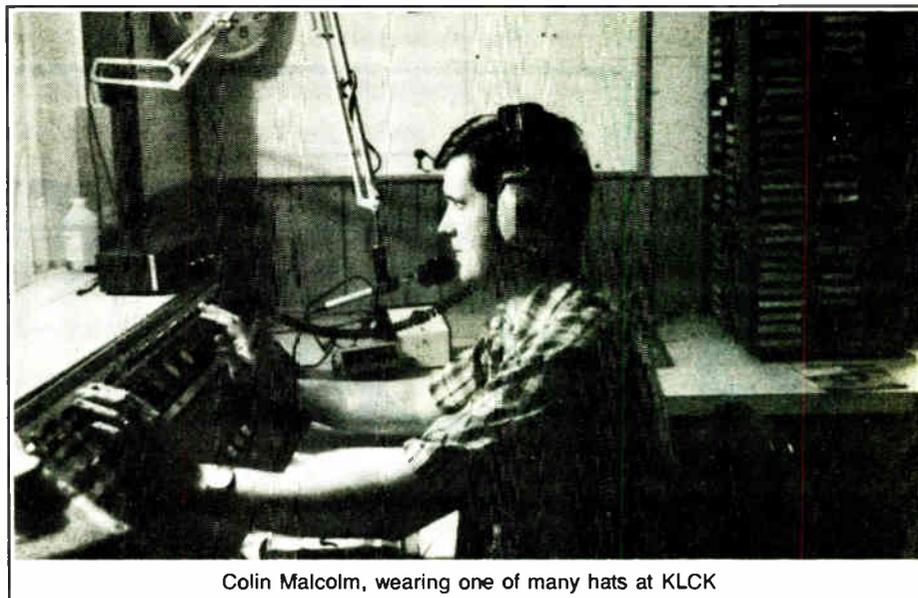
Sightless engineering

When it comes to engineering, Malcolm would not hesitate to say that he has his own way of doing things. Many of his methods are audio adaptations of what the rest of us "see" as engineering. For instance, much of Malcolm's troubleshooting is done with what he calls his "squawk box."

"If I'm in a hurry to troubleshoot something, I scan with an audible continuity checker before I use my volt/ohm meter," he commented.

Malcolm's volt/ohm meter also gives him audible readings, as does a light probe that tells him shades of wire

Malcolm . . . is always looking for new equipment that will narrow the gap between the sighted and blind engineering.



Colin Malcolm, wearing one of many hats at KLCK

Since funds were low—most of them came from the sale of their house—Stargel relied on creative engineering to back up creative financing. "It was called, 'Make a radio station with all the old things that nobody wanted anymore,'" he admitted.

The BC5T transmitter that nobody wanted, for instance, needed to be converted to 10 kW power. And the transmission line, a television station's has-been, needed to be cleaned of corrosion and rust. And of course, Stargel and his wife needed to construct the building, design and build the directional antenna system and deal with the aftermath of

(continued on page 34)



Jim Stargel runs the board at KMJY.

ery once in a while he enlists the help of a set of eyes, usually his wife's, who helps run the station along with another employee.

An inner vision

Malcolm, on the other hand, doesn't see at all. Except for an inner vision, Malcolm has never seen the small station he helped build from tower to studio five years ago. What is more surprising is that Malcolm was one of three visually impaired individuals to have introduced KLCK to the airwaves.

"Because there were three of us that were blind, the carts were in braille, the records were in braille—as they are today," said Malcolm. He added that they had a rope system that led them from a temporary transmitter building to a temporary office during the first six months of the station's operation.

For the two blind announcers, and for Malcolm who not only announced but handled the station's sales and engineering, the rope system was perhaps their greatest company perk. Malcolm, being the station's engineer, was the inventor of this luxury.

For those of us with unimpaired vision, it is hard to imagine a sightless en-

gineer. And, like most radio engineers, Malcolm has been known to take a screw driver to these devices and to rebuild them to suit his purposes.

Malcolm says he is always looking for new equipment that will narrow the gap between sighted and blind engineering. His latest acquisition is a device that will check audio levels by signalling a beep when pre-set thresholds are met.

Science Products for the Blind and a number of other organizations are where Malcolm looks to narrow that gap and he's finding audio adapted measurement tools more and more plentiful in the past few years.

"We've gotten into a world where everything has become digital. In some cases, that has made it easier for people like myself and Jim," Malcolm noted, explaining that digital technology has widened the window for the type of equipment he uses.

"The miniaturization is a little bit hard on us, but the fact that we're getting away from high voltage and tubes is a real plus."

Stargel agrees, although he still has his share of tube-type technology with his '50s vintage Gates BC10T transmitter. When he does run into the occasional IC

board, Stargel said he has his own methods of dealing with the situation.

"My wife," he noted, "is a real whiz with the soldering iron. I just tell her what parts to put where."

In fact, it was with this pair of eyes between them and Stargel's marginally good eye that the two built the station from the ground up.



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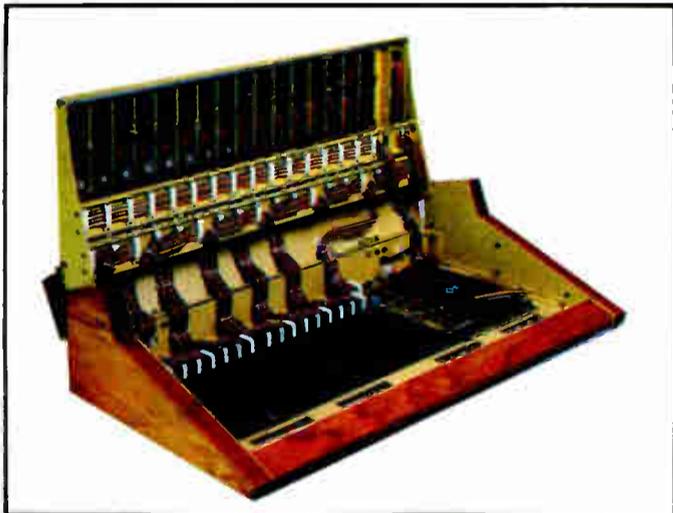
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Interior View of the 5000 Series Console

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Making the Switch to Digital

by Mel Lambert

Studio City CA Over the past several issues, I have laid the groundwork for discussing the expanding applicability of digital recording and editing in the radio environment.

The concept of a centrally located digital audio workstation is making its presence known to an increasing number of station chiefs and PDs around the country.

It makes little sense, I would suggest, to approach digital in too much of a piecemeal fashion. If we attempt to replace existing analog hardware with a digital equivalent, its functionality might be all too easily stifled by the need to emulate the analog version's front panel layout and inherent operational limitations.

Instead, we need to form a holistic vision of the future.

The attraction of digital

For many radio broadcasters, the dramatically improved sound quality offered by digital recording, processing and editing systems is only one aspect of their attractiveness.

Of greater importance are the enhanced operational features that all-digital systems offer, including high-speed access to digitized audio stored in RAM, hard disk or optical drives.

With such systems there is no tape rewinding. There is also freedom to remap control surfaces as necessary under software commands; the ability to rehearse non-destructive edit sequences; the ability to sequence the playback of digital sound files against a master station time reference standard and so on. Digital really does extend our creative power in the broadcast studio.

Few of us can doubt the sonic and operator convenience of going digital; how then should station staff best get a handle on this total studio concept?

Instead of considering how a digital

equivalent of an existing analog-based on-air or broadcast production studio might function, I find it more useful to sketch in my mind the functions I would like. Then I can gather together the digital building blocks that can be assembled in the studio to achieve my desired goals.

A typical studio

Starting with a "typical" on-air studio, we would need a central video display to allow a cue list to be developed. We would also need a means of controlling the start/stop of individual items on that list of audio events—replayed from RAM or hard disk storage, or possibly taken as a live insert and then controlled in level by some form of processing control surface.

DIGITAL DOMAIN

I'll assume for the moment that EQ and dynamics control will be designated pre-production functions and not essential or real-time functions for an air-board. If necessary, however, these additional control elements could be added at a later date.

The specially developed software running on the controlling workstation would enable the DJ or operator to call up libraries of audio material stored on hard disk or optical drives.

This would be in addition to master libraries of removable media containing, let's say, the station's collection of "Sixties Classics" for the afternoon drive time host.

Using a simple menu-driven display and possibly a mouse or trackball, these sequences could be loaded into a scratchpad file and then transferred to the running log of the show being created on the workstation. Commercials and station IDs could also be added

where necessary.

The entire file could then be off-loaded to floppy for safe keeping, or to a password-protected section of the hard disk out of harm's way.

Calling up events

When the next on-air event is needed, the same list can be scrolled through a pulldown window on the workstation's VDU and either initiated manually or set up to fire off the back of a previous cue (such as an end tone at the close of a satellite news feed or a pre-determined time point).

While the material is being played to air, the DJ or operator would use the workstation to interrogate the running order for the next show, set up a sequence of news cuts or even wander through the music library files looking for a favorite song or other material with which to bedazzle the listening audience.

Having access to such large amounts of on-line data and the means to extract the audio cues and associated timing information would greatly enhance the creative freedom of station engineering staff and the on-air talent.

Imagine hitting a single key and having the system display a now-line and/or digital on-screen countdown from the start of the current song that has just started replaying from hard disk.

Such a system could even show the time remaining on a 17-second instrumental introduction over which the DJ can safely chat until the beginning of the song's vocal section.

Production requirements

In the production studio, the same workstation format would enable the engineer to call up digital sound files entered into the system from DAT source reels, or commercial music CDs, to be edited and manipulated using sophisticated menu-driven software.

Because all edits are performed non-

destructively, the original source material is always available to the operator. (This means that, unlike traditional analog editing techniques, any mistakes can be instantly rectified without having to search the floor for scraps of 1/4" tape from a previous, unsuccessful edit session!)

Without leaving his or her seat, the operator can call up favorite signal-processing programs that allow, let's say, a characteristic reverb sound to be added to station promos and other "personality" IDs.

Once memorized by the system, all EQ, ambience and processing algorithms and control parameters from previous sessions would be instantly available.

The concept of connectivity would also extend to existing digital systems. Currently, I'm working on the design of a software program to provide full remote control of a well-known studio DAT player from an Apple Macintosh.

Using Apple's HyperCard program and its user-friendly HyperTalk language, I am able to map each of the front-panel controls, including the sequencing and Start/Skip/Record/Erase functions, to on-screen "buttons" and accompanying panel display.

At the same time I am also consulting with a leading supplier of digital audio workstations, whose controller and editing software also run on an Apple Macintosh PC.

My next task will be to link the two programs through a multi-tasking program, MultiFinder. I may even enable the DAW editing software to directly control the DAT player's Stop/Start/REW/FFD functions and significantly automate the downloading and uploading of source and edited material between the two components.

(It goes without saying, of course, that all transfers will be done digitally, using the DAT machine's AES/EBU-format digital In/Outs at the appropriate sampling frequency.)

Sure, we've had access to computer- and microprocessor-controlled remote controls and software for a long while now; sophisticated station automation systems are but one example of a master clock-drive computer handling the replay sequencing of carts and other audio sources.

(continued on page 34)

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the next step

Midwest Call Signs and Border Radio

by George Riggins

Los Angeles CA This month let's take a look at some of the older stations of the midwest and reflect on the heyday of broadcasting from south of the border.

WIBU, Poynette, WI is credited as going on the air some time during July 1925; its original frequency is given as 1310 or 228.9 meters. In 1929, the station was listed as having 100 watts of power.

By 1938 WIBU was on 1210—247.8 meters—still at 100 watts and the owner was listed as William C. Forrest. The station was caught in the frequency change shuffle of 1941 (29 March 1941, to be specific) and moved to the present spot at 1240, power 250 watts. The owner was still William C. Forrest, who listed himself or his wife as everything except Chief Engineer.

Poynette was far enough out of the main stream to have the telephone num-



ber listed as "97R5." The "R" must have stood for one short, one long and one short ring. I wonder how many of those early telephone operators realized that they were really sending International Morse code when they did the ringing.

On the other end, probably very few of the subscribers knew they were being called with the same code that the radio operators were using.

Tilting at windmills

Remember the Wind Charger contraptions of the '20s and '30s? My first large scale introduction to a windmill attached to a generator was in 1934 during a trip across the mid section of the US.

It seems that before the days of REA (Rural Electric Administration) most of those living out of town had no ready access to the electric grid of the time. In

order to have a radio receiver one had to provide the power.

Batteries and the Wind Charger were the order of the day. As told to me, the WIBU call letters indicated "Wind Is Being Used." Supposedly, the station was powered from a bank of batteries that was kept charged by using wind generators.

At 100 W that should not have been hard to handle. After all, the telephone companies have been using battery power for years (or has any one bothered to look in the basement of a telephone building recently?).

St. Louis radio

Melvon G. Hart, WORV, sent along some comments about WIL in St. Louis. According to *Radio News* for June 1923, the WIL call was issued to Continental Supply Co., Washington, DC. The June 1926 issue of *Radio News* listed WIL as being in St. Louis with 250 watts of power on 273 meters.

By 1929 the station was listed as owned by Missouri Broadcasting Corp., 1200 kc/249.9 meters, 100 watts power—higher power during daytime hours. The station shifted frequency to the present 1430 on 29 March 1941 and was given Class IV status.

The station now lists power as 5 kW-U, DA-2. According to the comments from Melvon Hart, "WIL was founded by Les Benson, W0ZB, and his brother in about 1922 and was believed to be the oldest commercial radio station west of the Mississippi." (In 1941, Les Benson was still active as owner and GM of WIL.)

WEW, reported to be the oldest station in St. Louis, was owned by St. Louis University and was non-commercial. WIL also claimed to have made the first police call broadcasts to St. Louis police cars. A photograph, reported to be displayed in the station lobby, shows a St. Louis police car, an open touring model, with a flat top antenna supported by masts at the front and rear of the car!

Bob Nicholas went to work for KXOK-

58 YEARS AGO

Editor's note: The **RW** of today and the **RW** of old, printed for a period of time in the 1920s and 1930s fortuitously share the same name.

\$1,000,000 to De Forest Co.; Tube Dispute Settled

An agreement has been reached between the independent tube manufacturers, as the unlicensed ones were called, and the Radio Corporation of America, whereby all financial differences and suits are satisfactorily settled, and the independents become licensees. Also, all of the patents are pooled, so that the licensees obtain full protection, a situation not yet obtaining in the set licensing field.

The outstanding financial feature was the agreement by RCA to pay the DeForest Radio Company \$1,000,000 forthwith, in consideration of its tube patents.

The agreement brings an end to the suit against RCA for \$47,000,000 damages by independent tube manufacturers who, having obtained an injunction against a restrictive clause in RCA licenses to set manufacturers, claimed damages to their own tube sales. This restriction was clause 9 that provided all licensed set manufacturers must equip their sets initially with only RCA tubes. Before the injunction was granted RCA abandoned the clause as bad business policy.

Out of the tube clause suit grew the attempt to rule the stations of RCA and subsidiaries, both broadcasting and message-sending, off the air, because of violation of the Sherman act prohibiting monopoly and restrictions in restraint of trade. The Radio Law adds the penalty of license forfeiture for such violation as affecting communications. However, the Federal Radio Commission ruled, 3 to 2, that the tube clause did not affect monopoly of communications or restraint of trade thereunder.

The terms of the agreement newly reached include the acquisition of licenses under RCA patents by the active tube companies, including the De Forest company, the Gold Seal Electric Company, Arcturus, the Republic Radio Tube Company and the Diamond Radio Tube Company. In the same understanding, RCA and licensed concerns acquire tube-making rights under patents held by the De Forest Company.

Reprinted from *Radio World*, October 3, 1931

St. Louis in 1939 as an engineer. It seems in those days one just about had to have an EE degree to get a job on the technical staff of a radio station.

Bob says he spent the first year out of college tramping through the swamps of Louisiana with a seismographic crew before he was able to "catch on" at the station. Bob reports he was told that the KMOX call was assembled from K for Kirkwood, MO for Missouri and X because the station went on the air at "X-mas."

At least this makes a good story. As for police calls being given out on

the broadcast band, Bob had no comment. Bob does, however, have several comments regarding Transit Radio in St. Louis.

Dirty relays

It seems that one of the problems with Transit Radio involved dirty relay contacts. At the time there were no enclosed relays, so dirt and grime got into the contacts, and then someone—usually Bob—had to find the problem bus and clean the relay.

The solution was a relay cover made of

(continued on page 32)

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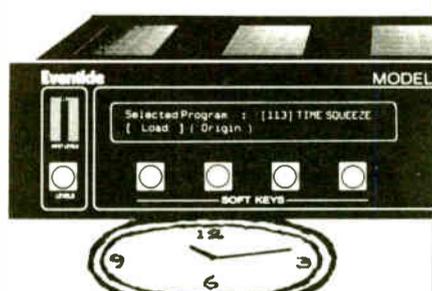


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*Radio Technology Component Grand Prix '88, CD Division, Stereo Sound Component of the Year (1988) & Best Buy (1988)

World Radio History
Circle 8 On Reader Service Card

A Guide to Extra CD Mileage

by Laura Tyson

Parsippany NJ When Sony and Philips first introduced the compact disc player in the US back in 1983, it was hailed as the near perfect storage medium for the 21st century. Digitally encoded music is stored on a 5" scratch-resistant polycarbonate disc.

The thickness of the disc causes any dirt or fingerprints on the surface to appear insignificant to the laser pick-up, which only focuses on the reflective information—a seemingly perfect storage medium. Unfortunately, the CD has not lived up to its reputation.

If you recently added a CD player or two to your on-air studio, there are a few things to keep in mind. CDs, contrary to popular belief, are not perfect.

The purpose of this article is to help you recognize some of the potential problems with compact disc technology and hopefully allow you to maintain a good relationship between your CD player and your discs.

How it works

To understand the big picture, first take a look at the CD player. The CD player can generally be divided into three main sections: the servo/mechanical unit, the audio processor and the CPU.

The servo section includes the optical pick-up which collects data from the disc, the turntable platter and the error correction and digital processing circuitry.

The audio section then converts the digital signal back into analog, performs filtering and amplification and sends it out into the world.

The CPU is the master controller and communicator between the servo section and the audio section. Pretty straight forward.

When a disc is loaded, it spins at a constant linear velocity. The data is read by the player at a rate of 4.3218 million

bits per second.

Only a mere 1.14 million of these bits are actual audio information, the remainder being dedicated to timing information, sub-code and error correction.

The smallest unit of time recognized by the player is one frame, which is 1/75th of a second. A frame consists of 588 bits and occupies 0.163 mm of real estate on the disc.

The disc

By this time, I hope you've had a chance to closely examine a compact disc. They're not all the same, are they?

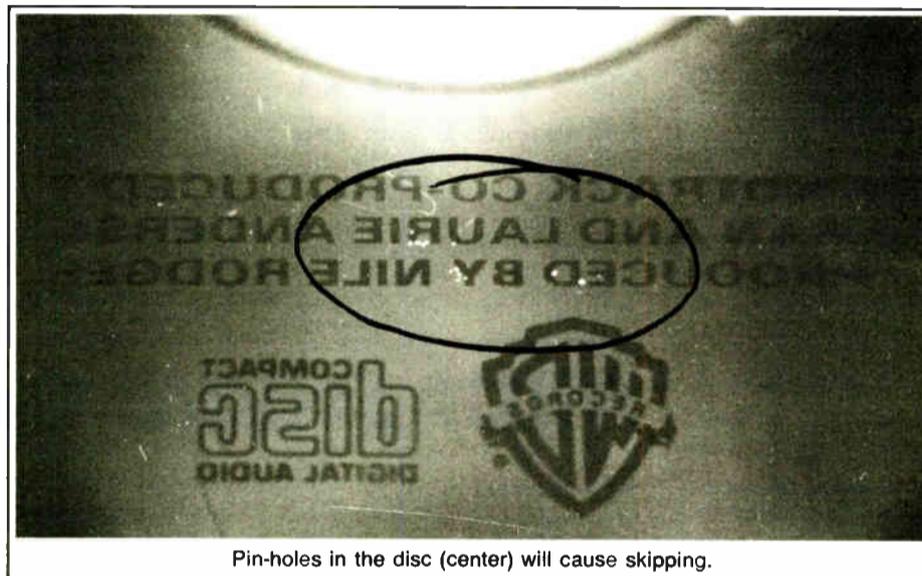
strate, not including the reflective coating, protective layer and label ink is 1.2 mm, ± 0.1 mm.

Since the thickness for the reflective coating is a mere 0.11 micrometer, it becomes negligible in contributing to the total thickness of the disc.

Imagine a disc manufactured to have a total thickness of 1.5 mm, with a clear plastic substrate thickness of 1.1 mm.

According to my calculations, the thickness of the label ink and protective coating would be less than half a millimeter!

Thus any scratch or damage which occurs on the label side of the disc is much



Pin-holes in the disc (center) will cause skipping.

You'll probably notice that some appear a bit thinner than others.

If you hold a disc up to a bright light, you can usually see a few pin-holes. Some older discs in your library may have so many pin-holes that they look like a starry night when viewed from under a light.

The disc thickness is 1.2 mm, +0.3 mm/-0.1 mm. The disc can be a little too thick, but not too thin.

The thickness of the clear plastic sub-

strate is more lethal than that which occurs on the data side.

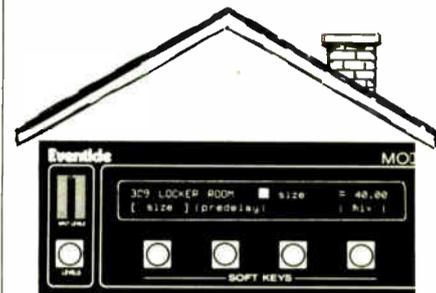
Seeing for yourself

It doesn't take too much to wipe out the reflective coating. Just take a ball point pen and write your name on the label side of the disc, using normal pressure.

You should then be able to see your name spelled backwards on the data side of the disc. Then throw the disc away,

(continued on page 30)

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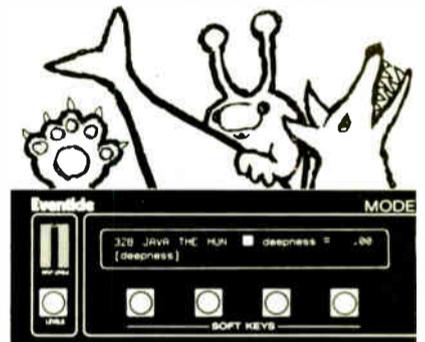
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Circle 17 On Reader Service Card

Getting More from CDs

(continued from page 29)

because it won't play in your CD player anymore.

The reflective coating of the disc is usually aluminum. Aluminum is great for its reflective properties, however it tends to oxidize easily.

If a hole is present in the protective layer between the label ink and the reflective coating, progressive oxidation will occur. This is known as "disc rot" and yes, it will cause skipping.

Other potential manufacturing problems can cause numerous headaches for CD players. Discs which are too thick or too thin cause cueing problems. Track eccentricity and poor reflectivity properties will cause skipping.

Most discs available from record stores should be within the correct specifications. Some promotional discs may be only close to the correct specs.

Next time you experience a trend of intermittent skipping, try tracking the errors according to disc manufacturer. Note how many problems occurred on promotional discs.

What you can do

One of the most obvious ways to prevent on-air skipping is to keep the disc absolutely immaculate. With DJ's constantly handling (or sometimes, mishandling) the disc, this is next to impossible. Thus periodic cleaning of the discs becomes mandatory.

There are many commercially available disc cleaners on the market. I prefer the old-fashioned method. Simply fill a

pan with a mild solution of soapy water (Ivory Liquid works fine) and gently wash the crumbs and pizza grease off each disc.

The chemist at Denon's CD pressing facility suggested this method to me. I've tried it with good results.

Some use compressed air to blow the dust off the disc, however this does not remove any sticky substance which might be adhering to the disc surface, such as nicotine.

(Maybe you've already had the privilege of seeing what nicotine does to the inside of a tape cart machine. With a CD Player, it's worse.)

After gently washing the disc, pat it dry with a paper towel. I know one radio station engineer who swears by Bounty's microwaveable paper towels.

Once the disc is more or less dry, use compressed air to get the finishing touches. This will prevent any abrasion to the disc.

Make sure the disc is entirely dry before placing it back in the cartridge or jewel box. The polycarbonate substrate is considered "hygroscopic", which means it will absorb water easily. A disc with high water content will tend to warp, which again, can lead to skipping problems.

When skipping occurs

So a disc skipped on the air. How can you prevent it from happening again?

First of all, find the track number and time in the track at which the disc skipped. Play

that section in the player again. Does it skip?

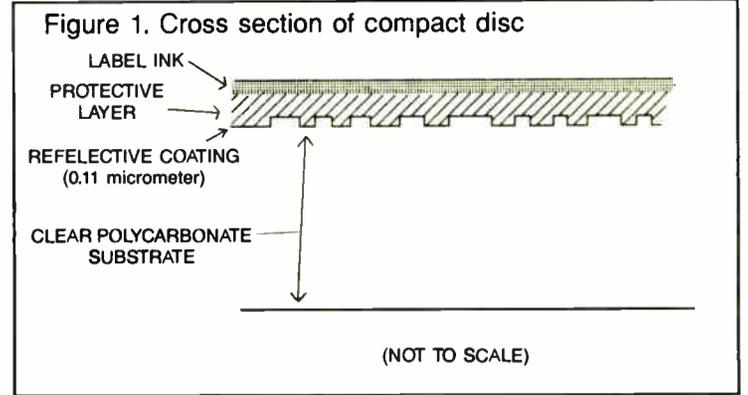
Examine the disc for pin-holes and scratches. Carefully check the data side of the disc for scratches which do not appear to have any shadow. These types of scratches originated from the label side of the disc, and the disc must be replaced.

Excessive pin-holes in a disc will also mandate replacement. Recently, a favorite disc of mine began skipping repeatedly in my car CD player.

Close examination revealed that the skipping was caused by a large pin-hole. I am now having the disc replaced by the CD pressing plant which manufactured it, at no charge.

How to improve your discs

If you have a disc that has managed to get scratched, do not despair. Depending on the direction of the scratch, you may be able to polish the disc in such a way to eliminate the



occurrence of skipping.

This process requires a bit of practice, so you may want to sacrifice a few discs which are not too precious to start off with.

Just place your own scratch in the disc, then try your luck at polishing the scratch.

Toothpaste (Crest), car wax and glass polish have all worked for me. Always polish in a radial direction, perpendicular to the data track.

By smoothing out the edges of the track, you will increase your CD player's chance of playing through the scratch without skipping. In the worst case,

replacing the disc is the only solution.

Perhaps you have already had your own experience in CD lifesaving techniques. If anyone knows of a sure cure, I would like to know.

But in the meantime, please remember: compact disc technology is relatively new and will surely undergo growth and improvements in the years to come.

■ ■ ■

Laura Tyson is a Sales Engineer for Denon America and is presently in charge of all Denon Broadcast CD Players. She responds to all faxes sent to 201-808-1608.

MIDI Studio Components

(continued from page 22)

DIN plug on each end, are used to connect synths, drum machines and computers together so that they can communicate with each other.

A last option is a good quality microphone, to record vocals and acoustic instruments on tape, or for recording your own samples.

A system made of the above-listed components is called a

musical workstation. The components might be separate or combined in single package.

The components

For example, a workstation might be a keyboard with a built-in synthesizer, sampler, and sequencer. That's everything you need (except a monitor system) to compose, perform and record instrumental music. Some workstations in-

clude drum sounds, so you can get by without a separate drum machine.

If you want to record songs with vocals, or do voice-overs, you also need a tape recorder or recorder/mixer.

One example of a keyboard workstation is the Roland W-30. It includes a 61-note keyboard, a read-only memory (ROM) with frequently used sounds, a sampler with 52K RAM memory, a 16-track sequencer, a 3.5" floppy disk drive to store sequencer recordings and a large LCD display.

Each track of the sequencer can play up to 16 MIDI channels for a total of 256 independent, simultaneous parts. Sounds can be played with 16-voice polyphony (16-note chords). It can layer (mix) or independently play eight parts at once and each part has a separate output for individual effects processing.

With equipment such as this, your MIDI studio can be used to create spots with music that is unique to your station.

One final note. In talking about combination mixer-cassette recorders available to help you set up a cost effective multitrack studio, I neglected to mention Tascam's 238 8-channel cassette multitrack recorder.

The 238 has been in the market for over a year and like the 388 8-track open reel recorder allows for eight track production in a compact space.

■ ■ ■

Bruce Bartlett is a microphone project engineer and technical writer with Crown International. He can be reached at 219-294-8000.

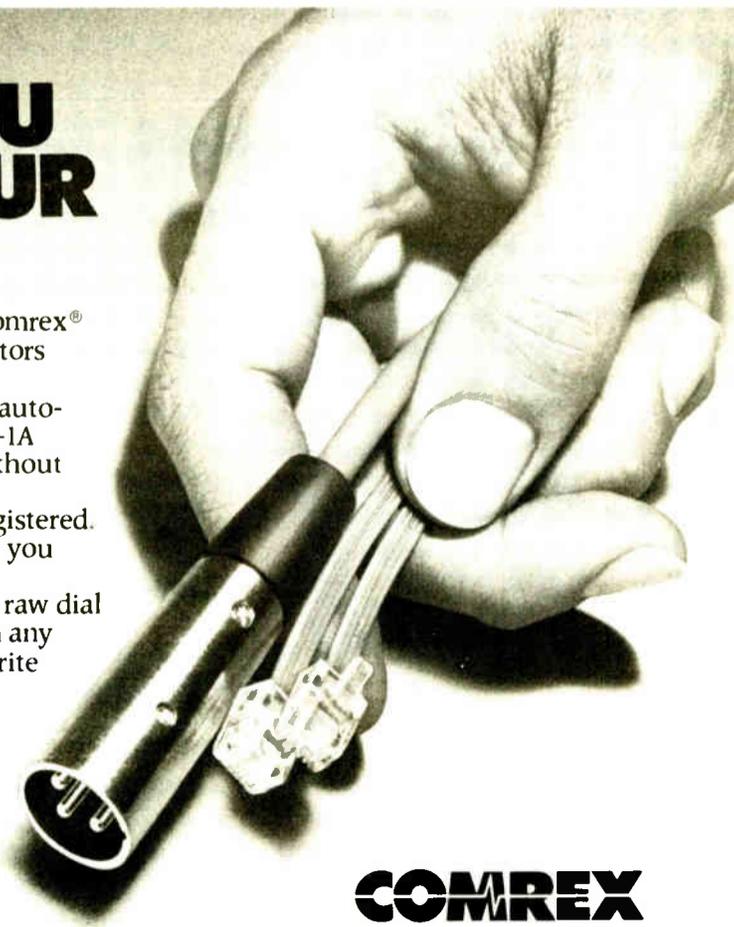
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PMC-450 Tri-Band Peak Modulation Controller



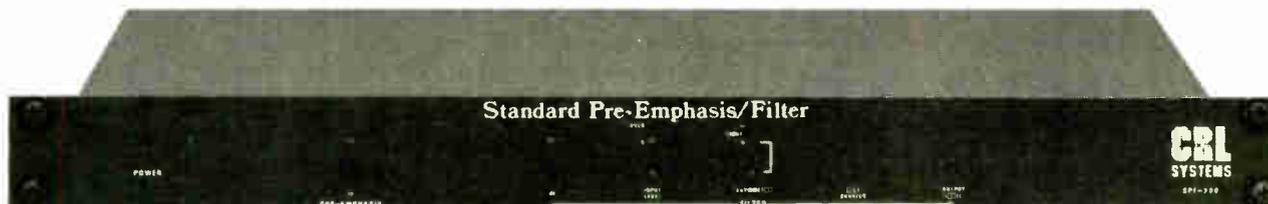
The CRL PMC-450 Tri-band peak modulation controller incorporates many unique designs originally developed for AM stereo. This unit offers state-of-the-art circuitry coupled with precise implementation of the NRSC standards for the loudest, cleanest signal on the AM dial. The PMC-450 consists of a powerful input compressor, followed by a tri-band limiter section and NRSC compliant low-pass filter. The flexible design of the PMC-450 allows it to be used as a stand alone processor, or in conjunction with various audio AGC's and pre-processors.

SMP-950 Tri-Band AM Stereo Matrix Processor



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MDF-400/800 De-Emphasis/Filter for AM Monitors



The CRL Monitor De-Emphasis/Filter provides all the functions required to update any AM modulation monitor or wideband monitor receiver for the recently approved voluntary transmission standard. This allows easier setup of audio processing equipment by emulating the audio characteristic of the best-possible commercially produced radios. Additionally, the unit has features which can reduce interference typically heard in the station air monitor.

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Call Signs and Border Radio

(continued from page 27)

rubber, but Bob says he could not ask the bookkeeper to purchase a couple dozen rubber relay covers at the pharmacy, so he just put in a bill for "relay covers!" Only the engineering staff really knew what was used for the covers. More about Transit Radio later.

In looking over the St. Louis listings, one interesting call and description belongs to KFUD(AM), Clayton, MO. The station is listed as non-commercial, on the air since 14 December 1924, and licensed to the same owner today: the Lutheran Church-Missouri Synod.

I am assuming that Concordia Seminary is part of the Lutheran Church because the Seminary is listed as the owner in early publications. There have been many general managers over the years, but who can top this—the same ownership for over 64 years. That's continuity!

Border broadcasting

Does any one have a copy of *Border Radio* by Gene Fowler and Bill Crawford for sale or loan? I would like to have the opportunity to go through the book, and extract some of the data on the many stations that were in Mexico, but really aimed at the audience north of the border.

Another book that has been mentioned was published in 1974, at North

Little Rock, AR, is titled *Arkansas Airwaves*. If there are a couple of copies looking for a new home, I know of at least two people who are interested.

I'll even settle for a loan or rental of either or both of these books. State your terms and conditions.

On the subject of border broadcasting, here are some thoughts about *Wolfman Jack*. Evidently this personality figured quite prominently in border radio in the '60s, '70s and into the '80s (but this is recent history).

Wolfman Jack was a very interesting person. I had the pleasure of doing a

couple of minor repair jobs in his studio complex several years ago. One would have had no way of knowing what his air personality or image was from a casual meeting, but put him behind a microphone and what a change.

Border radio in Southern California is now aimed at the Spanish speaking audience. There are at least two local organizations in Los Angeles taping programs for next day broadcast from south of the border. The tapes are shipped to the border and then taken by courier to the stations in Mexico.

XEGM and XPRS are two of the more

powerful border stations. Just how much power is radiated is a good question; all I know is that I can hear one or both of the stations well north of the local area. But this is getting ahead of the story. We'll want to get back to the beginning and start with the story of Dr. Brinkley next month.

One parting question—does any one remember the MITS computers by Southwest Technical Products? Are there any still in use?

■ ■ ■

George Riggins has experience in radio and electronics dating back to the 1930s. He is also a licensed ham operator and has had his own broadcast sales and service company, Riggins Electronic Sales, for over 20 years. He can be reached at 213-598-7007.

How to Construct a Poor Man's DA

(continued from page 19)

means to tap off a signal without loading down the source.

A bridging input has an impedance that is at least 10 to 100 times greater than the recommended load impedance. A value of 10K is typical. You can connect many bridging inputs to a single driving output without loading it down.

This is somewhat contrary to the traditional broadcast practice of impedance matching. That, of course, was where every source was 600 ohms and every load was 600 ohms and every patch panel had terminating resistors so that the source would connect to a 600 ohm resistor if its load were removed.

Impedance matching was important with tube equipment because the load reflected to the plate of the tubes had to be just right or the amplifiers would be out of spec.

The op-amps used in most equipment today work differently. They are almost always high impedance inputs and very low impedance outputs. You have to add resistors to make them act any differently. Consequently, interconnecting equipment has gotten a lot easier.

Building bridges

Figure 1 shows an arrangement for connecting the recorders and other inputs to the board output. The key to making this work is that all loads must be bridging loads.

You can have one exception. Notice the 600 ohm resistor. That can be a resistor added to give the board its proper load or it can be one of the loads that always will be connected.

Fortunately, bridging inputs are easy to come by. Look in the manuals for your cart machines and reel recorders. There are probably some straps that can be rearranged to give at least a 10K input impedance. Audio processors have the

same arrangement. So do many control board inputs.

I've found that a neat way to hook up this arrangement is to fabricate a metal box, like a bud box, with five or 10 connectors in parallel. These can be Molex plastic or XLR chassis connectors. Leave yourself a few spares for expansion and test points.

Mount this box under the board and simply plug the equipment into it. Now, if you want to work on something or make changes, you can unplug one load without disturbing the others.

Don't be worried about the high impedance bridging inputs picking up noise. The impedance of the bus is set by the 600 ohm resistor or amplifier impedance, whichever is lower. Thus the audio feed will never be above 600. I'll talk more about impedances in an upcoming column.

So, now you know how to build a poor man's distribution amplifier. I hope it works as well for you as it has for me.

■ ■ ■

John Shepler is an engineering manager, broadcast consultant, writer and regular RW columnist. He can be reached at 815-654-0145.

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Blind Engineers Run Own AMs

(continued from page 23)

"all the old things that nobody wanted anymore."

"After we were on the air for two months, the audio drive deck in the 10 kW transmitter blew up," recalled Stargel, who found parts for the old transmitter in short supply.

"I used a Tapco 500 watt stereo audio amp and a pair of filament transformers (I was surprised to find they had an audio response that was flat to 15K!) to couple the audio from the output of the amplifier to the bridge in the main modulator. And then I built feedback ladders on plexiglass."

Not a small task for any engineer, especially one whose vision is a grand total of 20 over 650.

Seeing radio differently

Although Stargel and Malcolm employ different methods, both approach engineering from a point of view that for the most part is within their mind's eye.

Malcolm, for instance, calls upon the limited vision he once had to conceptualize his engineering tasks. "I was what they call a high partial—I had pretty good working vision so that I could get around and do most of the things that people do," said Malcolm. It was during

those years that Malcolm learned the basics of broadcast engineering.

At age 20, almost 14 years ago, Malcolm lost all his vision. The adjustment from limited sight to total impairment was a difficult transition. "But," Malcolm added, "my experience seeing helps me to conceptualize things."

Stargel, although not totally impaired and considered a "high partial," might have a limited view of the tasks before him; but in many cases what he sees is simply a validation of what he envisions in his mind. In contrast, his conversations with Malcolm are validations of what can't readily be seen before him on

the bench.

Explained Malcolm, "He (Stargel) can empathize and concur with me more than most engineers." The engineers-turned-radio-entrepreneurs have been concurring since 1978, a friendship that has spanned several engineering jobs and quite a few projects.

Their recent "projects" are by far the most trying engineering and entrepreneurial challenge in this radio decade. Both are almost one-man radio operators who handle sales, announcements and of course engineering for their small market, country format AM stations. And both are legally blind with a great eye for radio.

■ ■ ■

Editor's note: Colin Malcolm and Jim Stargel would like to hear from visually impaired engineers. If you are or know of a visually impaired engineer, contact Colin Malcolm at 509-773-3300. Radio World would also like to hear from vendors and suppliers interested in bringing this newspaper to visually impaired engineers via cassette duplication.

Dee McVicker is a free-lance writer with a long record in equipment sales. Comments on articles and inquiries about her writing service can be taken at 602-899-8916.

Go Digital

(continued from page 26)

But the use of a powerful digital audio workstation to control the various record/replay, editing, signal processing and coordinating functions necessary in the air and production facility is fundamentally different. Here, we have true desktop control of every audio task that we need to initiate in the studio.

Next time, I'll focus on the use of interconnected digital systems, and the further integration of production assignments.

■ ■ ■

Mel Lambert has been intimately involved with the production and broadcast industries on both sides of the Atlantic for the past decade, and for seven years served as editor of Recording Engineer/Producer magazine. He is currently president of Media & Marketing, a consulting service for the professional audio industry.

ADVERTISER INDEX

Page No.	Advertiser	Reader Service No.	Page No.	Advertiser	Reader Service No.
36	Allied		29	Eventide	40
37	Allied		26	Eventide	42
32	Allied		29	Eventide	39
38	Allied		27	Eventide	41
7	Allied		27	Eventide	35
20	Allied		1	Fidelipac	45
11	Allied		32	Full Compass	32
24	Arralis	27	27	Full Compass	13
26	ATI	34	39	Full Compass	20
7	ATI	5	6	Harris	48
19	Audopak	70	19	Hnat Hndes	33
11	Audionics	4	47	Modulation Sciences	38
8	Belar	25	12	NE Broadcast	16
12	Beyer Dynamics	18	13	Orban	46
3	Bradley	19	29	PAS	17
3	Broadcast Electronics	37	8	QEI	21
16	Broadcast Electronics	22	35	Radio Systems	14
9	BSW	6	14	Radio Systems	52
18	CCA	15	34	Radio Systems	11
31	Circuit Research Lab	59	15	Radio Systems	51
23	Circuit Research Lab	55	22	RF Specialties	29
30	Comrex	58	18	RF Specialties	9
20	Cortana	1 or 2	39	Schofer Digital	30
4	Current Technology	10	33	Studer Revox	12
17	Current Technology	24	28	Teac/Tascam	8
9	Cutting Edge	47	21	Teac/Tascam	28
29	Datoworld	53	2	Whetstone	61
10	Dalca	3	48	Whetstone	7
29	Eventide	36	22	Will Burt	26

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008	028	048	068	088
009	029	049	069	089
010	030	050	070	090
011	031	051	071	091
012	032	052	072	092
013	033	053	073	093
014	034	054	074	094
015	035	055	075	095
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Annual "Proof" Requirements

by Harold Hallikainen

San Luis Obispo CA Last month, we reviewed the station operator requirements, including the Chief Operator requirements of 73.1870. This time, we'll review the equipment performance measurement requirements of 73.1870(c)(2) and 73.1590.

We used to call this the annual "proof" although the Commission used the term "proof of performance" with respect to measurements on a directional antenna system.

The annual audio and spurious radiation measurements were "equipment performance measurements."

Several years ago, the Commission removed the audio measurement portion of the equipment performance measurements requirement along with the required audio performance.

The requirement was removed to demonstrate compliance with audio specifications along with removal of the audio specifications all together.

With the removal of audio performance requirements, audio performance was to be determined by "market pressure"—listeners would evaluate audio quality along with programming in making their listening decisions.

Unfortunately, the removal of the audio frequency response requirements also removed a standard aimed at ensuring "interoperability" between transmit-

ters and receivers.

It appears, however, that many stations had already abandoned the interoperability frequency response standard specified in the old 73.40 (for AM stations), by operating with various degrees of preemphasis to compensate for the high frequency rolloff of receivers.

INSIGHT ON RULES

This resulted in stations adjusting their audio response in response to variations in receivers, while receiver manufacturers adjusted receivers trying to follow the stations.

What appears to have happened is that receiver manufacturers mostly kept tightening up the IF in an effort to get rid of adjacent channel interference.

The tighter IF made the receiver manufacturers roll off the audio highs more, so the stations boosted the highs. This caused more adjacent channel interference, which led the receiver manufacturers to cut back further.

This interoperability problem is now being dealt with by the NRSC standard, which the FCC has adopted, in its own fashion.

The Commission is most interested in the bandwidth limitation portions of the

NRSC standard (the 10 kHz audio brick wall and the RF mask) and less interested in the standard preemphasis.

This gets back to the question of what the Commission's job is. Is it merely interference protection, or is it also to establish guidelines that require all transmitters to meet the same standards, so there is a possibility the receivers will work reasonably well?

Interoperability remains

We still have some interoperability standards in the rules. For example, 73.128 requires AM stereo compatibility with receivers using envelope detectors, although the specified tests only demonstrate interference protection (occupied bandwidth).

For FM stations, 73.317(e) specified a maximum audio preemphasis. This section used to include definite audio response limits, ensuring interoperability.

Finally, 73.322 specifies the FM stereo standards, which appear to be entirely to ensure system interoperability instead of interference protection. Of course, this section was written before the Commission got out of the standards business.

Note, however, that this section does not require that FM stereo systems use this standard, but merely that any station that uses 19 kHz shall use it to transmit stereo meeting this standard.

Note also that 73.322(a)(3) does not preclude the use of other stereo subcarriers, hence the design of the FMX system, which uses another AMDSBSC subcarrier at 38 kHz (in quadrature with the subcarrier required by this section).

This "protection" of the 19 kHz subcarrier is similar to the protection offered the television BTSC subcarrier by 73.682(c). It's sort of an intermediate step between FCC standards and "marketplace" standards.

Performance measurements

When the FCC dropped the audio measurement requirements, much of the trade press wrote that the FCC had dropped the annual "proof" requirement.

As mentioned above, only the audio portion of the equipment performance measurement requirement was dropped. We'll look at 73.1590 to see what is still required for radio stations.

All AM, FM and TV stations (except Class D NCE FMs operating with 10 watts or less TPO) must make equipment performance measurements of each main (not auxiliary) transmitter when one of the following occurs.

Installation of a new or replacement main transmitter.

Modification of a transmitter as permitted under 73.1690(e).

Installation of AM stereo transmission equipment under 73.128.

Installation of FM subcarrier or stereo equipment under 73.295, 73.287, 73.583 or 73.597. Note that these measurements must be made even if you're just changing a remote control that uses a subcarrier to return metering.

When required by other provisions of the rules or the station license.

These measurements must be made annually for AM stations, with not more than 14 months between measurements!

Note the annual requirement for AM stations. Note also the requirement that

measurements be made when changing subcarrier equipment.

Rule 73.1590(b) requires the measurements to demonstrate compliance with the transmission system requirements appropriate for the station (73.44 for AM, 73.317 for FM).

These are all RF bandwidth requirements, except that 73.317(e) requires that the audio preemphasis in an FM station may not exceed that of a 75 μ second network.

The measurements for an operating AM station are to be made at ground level about 1 km from the antenna center, with the station operating into the antenna [73.44(d)].

Further, if the station is directional, the carrier frequency reference field strength is to be based on a non-directional antenna (as determined by one of three methods).

Assuming the measurement is made in the major lobe of the array, where the actual carrier field strength is higher than that of a non-directional antenna, the sideband and spurious radiation must be attenuated the specified amount below the ND field, which puts a more strict requirement on DAs than NDs.

Since the measurements are to be made with modulation [73.1590(b)], and the measurement area begins at 15 kHz from carrier [73.44(a)(1)], it appears that the measurements would have to be made with a spectrum analyzer (or perhaps a narrow band field strength meter).

This contrasts with the previous requirements where "evidence" that spurious radiation was not causing objectionable interference could be provided with a communications receiver.

The required measurement data along with a description of the equipment and procedures used to generate the data must be signed and dated and kept on file at the transmitter or remote control point for two years, and be made available to the FCC on request.

■ ■ ■

Harold Hallikainen is president of Hallikainen & Friends, a broadcast equipment design, manufacture, sales and installation firm. He can be reached at 805-541-0200.

Diodes

(continued from page 20)

know what the characteristics of the devices are before employing them in a circuit.

Maximum forward current indicates how much forward bias current the device can safely handle. Reverse characteristics are indicated in Peak Inverse Voltage or PIV. These two terms indicate the maximum operating parameters at which the particular diode can operate.

Review

Let's go over some of the main elements to remember from the first quarter of this series of lessons.

Solid state devices are made of one crystal "doped" to provide positive and Silicon and Germanium are the two materials normally used to make solid state devices.

Using the schematic diagram of a diode, identify the cathode and anode.

What is a negative temperature coefficient?

Know, from the applied voltages to a diode, whether it is forward or reverse biased.

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SMC Mini-Pro controller, (3) 350RS SMC Carousels, (2) RSC-100 Carousel programmers, (2) racks, excel cond, \$8200 FOB Yuma AZ. J Bassett, 699 S Avenue B, Yuma AZ 85364. 916-686-6613.

SMC 450 mono bi-directional Carousel (2), \$1625 ea or \$3250/both; SMC MSP-1 2000 event automation control head (RAM), \$3200. W Hanlon, WKFD, 19 Updike, N Kingstown RI 02852. 401-295-8808.

Sono-Mag SMC TS-25 dual channel 25 Hz tone detector, brand new, BO. A Weiner, Britton Rd, Monticello ME 04760. 207-538-9538.

Systemation including: (9) Teac VS30X cassette decks, Commodore 64 computer, monitor, printer, rack, \$8000. D Rose, KAAA, POB 3939, Kingman AZ 86402. 602-565-3664.

Harris control system from an older Harris automation system, working when removed, make offer. R Dammon, WKIL, POB 278, Albany OR 97321. 503-926-2233.

IGM Instacarts, (2) in use, avail 3/1/89, rebuilt 1 yr ago, \$7000 ea. S Rush, KTKK, 3595 S 1300 W, Salt Lake City UT 84119. 801-264-8250.

IGM stereo Instacart 48 trays no wear on any heads, looks new. D Roden, 1701 Monte Sano, Huntsville AL 35801. 205-533-3676.

MEI MP100 automation controller w/remote control, \$3000; MEI Control 3 (2) Carousel & controller, \$1000 ea. T Sheen, KWNA, POB 591, Winnemucca NV 89445. 702-623-5203.

SMC DP-1 automation system, including 5 stereo Carousels matrixed for mono, 4 Scully 270 bi-directional R-R, logging elect, in five racks, excel cond. D Englehardt, KSAL, 913-823-1111.

Broadcast Systems complete stereo automation system, excel cond, \$20,000. K Sleeman, WMMJ, 400 H St NE, Washington DC 20002.

Cetec 7000 GLS main carriage w/Hazeltine computer terminal & printer, works, BO. J DiNunzio, WDOM, 401-865-2460.

IGM automation system, complete, includes sequencer & master terminal, (3) Instacarts, (3) Scully 255 PB machines, Visitar cart encoder, Extel teleprinter, CBS Labs stereo peak controller 411, CBS Labs automatic level control Mdl III, (2) Marti CLA40H compressor limiters, \$9500; also Spotmaster stereo 5 chnl board, \$950. G. Teaney, KQXY, 117 Nederland, Nederland TX 77627. 407-724-1292.

IGM stereo Instacarts (2) each w/IGM EC interfaces, re-built 1 yr ago, \$7500 ea or \$14,000 for both. S Bush, KTKK, 3595 S 1300 W, Salt Lake City UT 84119. 801-264-8250.

Revox PR99 PBs (3), new, PB w/25 cycle switching tone sensors built in, sell together, \$1500 ea firm. B Coleman Jr, WIST, Box 460, Lobelville TN 37097. 615-593-2294.

Schaefer GLS-7000, (2) audiofiles, 48 tray, racks, all manuals, spare parts, Hazeltine controller, cables, complete, \$12,500. E Nichols, KMCR, POB 189, Montgomery City MO 63361. 314-564-2275.

SMC 252RS Carousels, 3 or 4 complete, excel cond; Control Design Corp CD28M, PAX, CD12C, 25S, 28X, will handle 12 or more sources, working when removed, 8 spare PC cards; ITC R-R, working when removed. J King, WROB, POB 1336, W Point MS 39773. 601-494-1450.

SMC Mini Pro satellite system w/programmer, (3) Carousels, (2) RSC-100 programmers, (2) racks, excel cond, on air. 916-686-6613.

Want to Buy

Carousel 360, need complete set of circuit cards. D Rose, KAAA, POB 3939, Kingman AZ 86402. 602-565-3664.

SMC MSP-12 satellite automation or similar set-up. C Young, WAYX, 1600 Carswell, Waycross GA 31501. 912-283-1230.

SMC DP-1 automation brain wanted in working cond for spare parts. G Paterson, KIMM, POB 8205, Rapid City SD 57709. 605-348-1100.

SMC TS-25 PCB, interested in other SMC boards. V Thompson KTOT, Box 2810, 575 Pine Knot, Big Bear Lake CA 92315. 714-866-3434.

SMC 350 Carousel, compatible w/SMC mini-pro automation; also SMC-Otari ARS1000 reproducer. L Amstutz, Lumiere Haiti, 4526 Arlington, Ft Wayne IN 46807. 219-429-8366.

Looking for complete automation system equipment, prefer cart system. B Carr, WRED, 1201 Fremont Pk, Woodville OH 43469. 419-837-9696.

SMC DP-1 Brain, 219 memory retention card, PN 53806, negotiable. K Klaas, KEZJ, POB 346, Twin Falls ID 83303. 208-733-7512.

CAMERAS (VIDEO)

Want to Sell

ITE H2 tripod head, excel cond, \$250. M Murphy, 11621 Valle Vista, Lakeside CA 92040. 619-561-2726.

Sony HVC-2400 Trinicon color camera, case, HVA-200 AC adapter, zoom lens, 25' extension cable, mint cond, \$600/BO. T Steele, Steele Comm, 1697 Broadway Rm 1404, Nyny 10019. 212-265-5563.

Panasonic WV-1410 2 3/4" B&W vidicon camera (2), no lens, 120 volts AC, \$75 ea; Onyx 1000 super small B&W chip camera w/lens & pwr supply, \$175. P Russell, WBOR, Sills Hall, Brunswick ME 04011. 207-725-3066.

RCA PK-701 color studio camera, \$200; Norelco PCP-90 color camera, \$150. C Haynes, POB 31235, Jackson MS 39206. 601-948-1515.

JVC KY 310 camera w/12-1 lens, 2x extender, AC adapter, battery, case, \$2995; Betacam YIQ component back for KY310, 210, \$695; package price \$3295. Also JVC CR6600 34" VCR w/RM 70U remote controls, \$995. All in gd cond. D Brennan, Custom Video labs, 205-823-0088.

Sony DXC-5000B color camera w/CCU, 33' cable, zoom lens, NTSC & RGB output, BO. M Cramer, WGBA, 1391 N Rd, Green Bay WI 54307. 414-494-2626.

Sony DXC1600 color camera w/camera control unit, lens, & pwr supply, as is, \$150. D Bailey, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

Want to Buy

Dumont camera chain & related equipment; also old image orthicon & iconoscope tubes. A Weiner, Britton Rd, Monticello ME 04760. 207-538-9538.

RCA TK1, TK10, T-K-30, TK-20 & accessories; RCA Houston-Fearless studio pedestal or tripod & dolly; Sony DXC-5000, DXC1600 color cameras; RCA TK-41 parts for a restoration. A Weiner, Britton Rd, Monticello ME 04760. 207-538-9538.

Sony DXC-M3A 3 tube saticon, Fujinon 12/1 w/2X ext zoom, ENG VF, 5" VF, rem lens/200 ohm control kit, AC-PS, 6' cable, \$6500. S Christian, Masterpiece Video Prod, 715 Cornwell, Silver Spring MD 20901. 301-439-5731.

Manual for Sony DXC5000BP color studio camera. S Shumate, WVIR, POB 769, Charlottesville VA 22902. 804-977-7082.

Viewfinder for Sony DXC-1210. Also need gd used Trinicon pick-up tube MF CT-1122, cabinet parts for DXC-1600, will consider entire cameras for parts if reasonable. C Lund, 203-756-7761 alt 4PM.

CRT Type 7TP4 for RCA TK II or TK 31 camera viewfinder or control unit. C Harper, 2081 Harmony Court, Lexington KY 40502. 606-268-8549.

Hitachi SK80 breakout box & service manual & schematic desperately needed. K Storm, POB 40554, Washington DC 20016. 301-953-0855/0747.

CART MACHINES

Want to Sell

Audiopak AA-4 (96) brand new, never out of case, 6.5 minutes, negotiable. C Harrison, Boise Viking Assoc., 5601 Cassia St, Boise ID 83706. 208-344-3511.

ITC 99BRPSE, excel cond, \$3500. T Gaiser, KUZZ, 3223 Sillect, Bakersfield CA 93308. 805-326-1011.

Rapid Cue recorder-reproducer & playback total of (3) machines, gd for parts, \$75/lot. A Weiner, Britton Rd, Monticello ME 04760. 207-538-9538.

Rapid Cue 1 R/P, 2 P/B, make offer. L Houck, Rollin Recording, 210 Altgelt, San Antonio TX 78201. 512-736-5483.

Gates/Harris Criterion Compact III triple deck in gd cond, \$800. B Howard, KOFO, Box 16, Ottawa KS 66067. 913-242-1220.

ITC premium record-play (6) mint cond, low hrs, 2 delay w/manuals, 3-PDI, \$1295/BO. J Phillips, WZOM, 414 Washington, Defiance OH 43512. 419-782-8591.

ITC RP (2) mono excel cond, rec/play, rack mount or table top case, \$900 ea. F Laverman, WMAM, POB 609, Marinett WI 54143. 715-735-6631.

ITC playback only, checked in very gd cond, \$650. F Laverman, WMAM, POB 609, Marinett WI 54143. 715-735-6631.

ITC Delta III stereo triple deck R/P, excel cond, new control logic board; ITC Series 99 play only (2), gd cond in service, prices negotiable/BO. M Bostic, WKLY, 259 Monroe, Rochester NY 14607. 716-454-3040.

Sono-Mag Mdl 592 stereo record-play, needs help, \$50 plus frt. S Sibulsky/J Bjornstad, KVNI, 208-664-9271.

Spotmaster 400A broadcast reel/play cart machine, works, \$250. F Laverman, WMAM, POB 609, Marinett WI 54143. 715-735-6631.

ITC 99B motors SALT2-2, ITC PN 455-0002-000 24V DC brushless servo type w/ceramic shaft. Includes 831-0258B servo card, (10), \$50 ea. W Bevis, WING, 717 E David, Dayton OH 45429. 513-292-5858.

Audicord type S-26 stereo, record & PB w/digital timer option, current model, excel cond, \$1000/BO. R Isenstein, WMEC, 107 Blossomcrest, Lexington MA 02173. 617-862-5705.

BE 3200 R/P stereo, 3100 play stereo, mint cond, original heads w/manuals, BO. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625.

Fidellpac zenith & height gages for aligning heads, never used, \$50. D Bailey, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

Harris Criterion III, gd cond, \$750. B Howard, KOFO, Box 16, Ottawa KS 66-67. 913-242-1220.

ITC 3D mono, all tones, vgc, \$1200; ITC SP, gd cond, one ea stereo & mono, \$650/stereo, \$600/mono; ITC RP stereo, \$1250. M Brown, 3740 SW Comus, Portland OR 97219. 503-245-4889.

ITC WP series mono R/P (2), \$750 ea, play only (2), \$500 ea; Harris Mono cart machines R/P (2), \$500 ea. Kidd Communications, 4096 Bridge St, Ste 4, Fair Oaks CA 95628. 916-961-6411.

ITC 3 deck mono PB (2) w/1 kHz & 500 Hz detectors, all w/manuals, call for details, \$700-800; ITC RP mono record/PB w/manual, \$700. P Little, KIEV, 104 N Glendale, Glendale CA 91206. 213-245-2388.

Pacific Recorders Tomcat PB (3), 19" rack, Maxtrax format, current revision, \$3875. M Bailey, Word Bdcgt, 1846 Roseneade Pkwy Ste 250, Dallas TX 75007. 214-601-1294.

Rapid Q dual cart, dual stereo PB, fast FWD, working, BO/trade. M Koscak, WSKB, Western Ave, Westfield MA 01085. 413-562-1950.

Tepecaster 700P PB, gd cond, \$300; ITC Premium mono R/P, mint cond, \$1000. J Phillips, WZOM, 414 Wash, Defiance OH 43512. 419-782-8591.

Tepecaster 700 RP w/extra motor, great cond, \$375. J Klauck, KFM Bdcgt, 118 Bay, Glens Falls NY 12801. 518-792-9290.

Telex MC-PRIII R/P audio cart machine, like new cond, all cables & instruction manuals, \$1100. L Chatman Jr, 609-768-5006.

Want to Buy

Ampro 3500 recorder/reproducer cart machine. D Rose, KAAA, POB 3939, Kingman AZ 86402. 602-565-3664.

ITC cart machines wanted. condition no matter. Parts & other brand machines seriously considered, cash paid. Jon Hall, Hall Electronics, POB 7732, Charlottesville VA 22906. 804-977-1100.

BE 1070 RPD schematic of delay circuit. R Delius, WFXC, 2515 Apex Hwy, Durham NC 27713. 919-596-2000.

Motor for ITC triple deck. P Anderson, KZBQ, Box 97, Pocatello ID 83204. 208-234-1290.

ITC Delta IV record amp for a Delta III, triple play machine. J Nichols, KZZU, South 5505 Regal, Spokane WA 99223. 509-448-5555.

ITC Series 99 record/play, stereo, plus Delta I and/or Delta III Stereo PB decks. Kidd Communications, 4096 Bridge St, Ste 4, Fair Oaks CA 95628. 916-961-6411.

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Amplex 351, new w/original electronics, mono, 1/4 heads, FT, \$750. R Majestic, Otic Inc, 2117 Bay Front Terr, Annapolis MD 21401. 202-485-6228.

Amplex 350/300 Series head assemblies & parts, cables, mono & stereo, 1/4 & 1/2, call with needs. T Steele, Steele Comm, 1697 Broadway Rm 1404, Nyny 10019. 212-265-5563.

Amplex 350 2 trk consoles (2), Auto-tec solid state C 5 conversions, \$2100 ea; Orban equalizer & sibilance controller. J Lee, United Recdg Labs, 681 Fifth, Nyny 10022. 212-751-4660.

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Amplex 440B in console, vgc, new head, spare new head & parts; Revox A700 vgc, rk or table mt. G Ermsle, Bayside Snd, POB 166, Lincoln City OR 97367. 503-996-6020.

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Amplex 300 (4), BO. E Meier, Rt 4 Box 98, Washington NC 27889. 919-946-2461.

Crown CX-800 2 trk tube type stereo open reel tape deck to trade for an old Revox A-77 deck, any configuration. E O'Brien, Imperial Snd Sts, RR31 Box 405, Terre Haute IN 47803. 812-877-2663.

ITC 750 playback, gd cond, recently overhauled & aligned, both mechanical & electrical set-up, includes manual, \$150; Scully 280B rec/play, gd cond, recently set-up, includes manual, \$700/roll-around cabinet, \$600/without; ITC 850 rec/play, new capstan motor & reel hubs, recently overhauled & aligned, includes manual, \$500 (available late Feb or early March). D Atkins, RF IN, POB 2186, Roswell NM 88201. 505-622-3861.

Nakamichi OMS-7 CD player, w/brand new remote, excel cosmetic cond, \$695. J Ritezel, Soundpresentations, 6216 So 153rd St #108, Seattle WA 98188. 206-242-9638.

Otari ARS 1000 (3) in gd cond; ITC 750 (3), gd cond. E Kazmark, KAPA, 2065 Ocean, Raymond WA 99577. 206-875-5551.

Scully 280 2 trk transport 7.5 & 3.75 ips, \$250; Scully 280 elect (2), \$100 ea; Amplex AG-440 transport, 2 trk/w xtra qtr trk play hd, 7.5 & 15 ips, gd cond, \$400; Inovonics 2 chnl elect, recently rebuilt w/power supply, \$350; Amplex AG-350 console, gd cond, \$150. E Helvey, POB 1357, Winchester VA 22601. 703-877-1191.

Stenocord 83, 18 dictator/transcriber recorders w/mics & 6' controls, uses microcassettes, in gd working cond, \$175/postpaid. L Graziplene, Graiien Research & Development, 3532 N Main, N Java NY 14113. 716-535-7251.

Uher 4200 report stereo, \$65 plus UPS; Braun AG TG1000, needs work, \$100 plus UPS. J Baltar, Maine Reel, 67 Green, Augusta ME 04330. 207-623-1941.

Wollensaak 3M 1520AV portable FT, re-conditioned, 7.5 & 3.75 ips w/manuals, very clean, \$150. J Ellingson, Ellingson Prod, 913 Warwick Dr, Cedar Falls IA 50613. 319-277-8535.

Amplex ATR100 2 trk stereo in cabinet on pedestal w/manuals, \$1500; Scully 280B 4 trk in Rusland roll around stand w/manuals, \$1200. B Carr, WRED, 1201 Fremont Pike, Woodville OH 43469. 419-837-9696.

Amplex 351 FT 75-15 ips in console, gd cond, \$325. P Smith, Summit Recdg Sld, 10639 W Warren, Lakewood CO 80227. 303-985-1993.

Magnasync MR-416, \$1500; Amplex 440C 4 trk w/2 head assemblies, remote, no servo, \$1900; Echoplata reverb, fair cond, \$200/BO. D Green, Waves Snd Recds, 1956 N Cahuenaga, Hollywood CA 90068. 213-466-6141.

Pioneer Rt-1050, perfect deck, freshly rebuilt, no transport controls, gd motors, brakes, hds, \$200. D Finn, Motive Media, 1615 Hamill, Chattanooga TN 37343. 615-875-2632.

Schematics & service manual for Dokorder 4 trk R-R model 1140, need desperately. C Caldwell, 508 N 29, Boise ID 83702. 208-384-1129.

Schematics & service manual for Dokorder 4 trk R-R model 1140, need desperately. C Caldwell, 508 N 29, Boise ID 83702. 208-384-1129.

Sony TC800 1-7/8-7-1/2 R-R portable, \$100. C Erway, 3450 SE Martinique Trace, Stuart FL 43997. 407-283-6871.

Teac RC 70/71 remote control for Teac/Tascam recorders, gd cond w/carton, \$40; Revox B710mk2 service manual, \$10; Revox B710 rack adapters, \$10. R Cannata, Cantrax Recorders, 2119 Fidler Ave, Long Beach CA 90815. 213-498-6492.

Teac 3440A 4 trk R-R, excel cond, \$600/BO; Teac M2A mixer w/MB20 4 meter bridge, \$200/BO. T Johnson, WVLJ, 8 Wilson TrPk, Urbana IL 61801. 217-762-2588.

Telex Series 300 tape duplicating system, R-R & (3) cass. slaves, w/manuals, \$800. B Carr, WRED, 1201 Fremont Pike, Woodville OH 43469. 419-837-9696.

Telex 300 cassette duplicator, reel & cassette masters, 6 slaves, \$1000. D Hams, Design Sds Teleprod, 216 Commercial, Waterloo IA 50701. 319-232-5604.

3M 56 16 trk 2", \$7000. K Fox, Fox Farm Recdg, 1431 Soudersville Ferry, Mt Juliet TN 37122. 615-754-2444.

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 Otari MK114 4 chnl 1/2" deck, new uncrat-
 ad, \$5000/BO. B Ardis, VoiceWorks, 4160 W
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 2642.

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 cassette, (2) cassette master units, CM1140;
 (2) dual position slave units CS1140; RR master
 unit RM1140; RR slave unit RS1140, manuals
 & spare parts, \$2250/BO. M Gellios, Pen-
 sacola Christian College, 904-478-8480
 X5041.

Tascam 70-4 1/2" 4 trk with Russ Lang wal-
 nut cabinet, complete w/audio electr in over-
 bridge & service manual, excel cond, \$1995.
 M Stram, Ron Rose Prod, 4309 W Lemon,
 Tampa FL 33609. 813-873-7700.

Tascam 32-3, excel cond, 7.5-15 ips, 10" reel
 cup w/RC-71 remote control, \$1100. F Grund-
 stein, WEGX, 3 Bala Plaza Ste 580E, Bala
 Cynwyd PA 19004. 215-667-3939.

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Teac 3440 4 trk w/remote control & RX-9 NR
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 andria VA 22310. 703-971-7069.

Uher 4000IC new in box w/hard case, 4
 speeds extremely portable 1 1/4" FT, \$450;
 Uher 4000S w/leather case & mike, 4 speed,
 1 1/4", gd cond, send for list of cables & access.,
 \$150. ER Arn, Film Assoc., 7240 Paragon Rd,
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 Datura St No 614, W Palm Beach FL 33401.
 800-826-0601, in FL 305-659-4805.

Teac 3300S/2T or 6100 2 trk stereo recorder
 any cond; Teac 3340, 3440, 40-4, 80-8 4 trk
 & 8 trk recorders in any cond. B Romonosky,
 WEBQ, Rt 45 South, Harrisburg IL 62946.
 618-252-6307.

Head covers for Tapesonic 70-TRS tape
 decks, one cast metal lower & one sheet metal
 upper cover; also a Magnecond PT6-V amp,
 the no speaker version. C Lund. 203-756-7761
 aft 4PM.

Magnafax 1/4" R-R duplicator or Magnafax
 1/4" reel to cassette bin loop, consider any
 cond, also buy manuals or copies for same.
 J Calloway. 214-272-8726.

Otari DP2700 cassette tape loader/winder.
 Also interested in other manual loaders or sal-
 vage or parts for same. J Calloway. 214-272-
 8726.

Pioneer RT-1050, need transport controls/re-
 lays. D Finn, Motive Media, 1615 Hamill, Chat-
 anooga TN 37343. 615-875-2632.

Wollensak 2770 or 2780 cassette tape dupli-
 cators or slave units. Will consider units in any
 cond or salvage/surplus parts for same. J Cal-
 loway, 214-272-8726.

Scully 280 1/4" headstack, hardware, etc; In-
 onovics 355 & 900 dual chnl R/P electronics
 w/pwr supply circa 1974. L Beigel, On-cue
 Recdg, POB 85042, L.A. CA 90072.

Teac Tascam 80-8 unit & vari-speed mixer,
 spare parts also considered. M Sokol, JMS
 Prod., 121 E Baltimore St, Hagerstown MD
 21740. 301-791-2562.

Technics RSM85 capstan motor, part num-
 ber QXK2010. Robin McDaniel, KJRG, Box
 567, Newton KS 67114. 316-283-5150.

CONSOLES

Want to Sell

Altec 1592A 5 chnl mic mixer, rack mountable
 to trade for a Sony MX16 or MX20 mixer,
 any cond. E O'Brien, Imperial Snd Sds, RR31
 Box 405, Terre Haute IN 47803. 812-877-2663.

Arrakis 2100SC-12S audio console w/stereo
 modules, brand new, 12 chnls, 34 balanced
 inputs, Penny & Giles faders, \$4000. B Ardis,
 Voice Works, 4160 W 182nd #208, Torrance
 CA 90504. 213-214-2642.

Collins 2122-1 remote amplifier, 4 chnl port-
 able unit, VU meter, tone control, headset lev-
 el control, 2 lines output, PA level, \$275 pls
 shpg. B Kidd, Airwaves Media Sales, POB
 976, Rayville LA 71269. 318-728-4574.

Gates Executive 10 input stereo console, gd
 cond, \$1500. B Glasser, WHBC, POB 9917,
 Canton OH 44711. 216-456-7166.

RCA mono, 9.5 inputs, modified, tube type,
 working & tested, \$250; Ampex prehistoric
 mixer, old but working, 4 inputs, 19" mtg rack,
 \$150. Bishop E Jackson, WJPC, Waterbury CT
 06704. 203-573-0554.

Tascam M-520 20 chnls, 6 months old, mint
 cond, \$4300. D Miller, Airborne Audio Produc-
 tions, 12037 Hemlock, Overland Park KS
 66213. 913-492-8822.

Tascam Model 5 w/expansion module, 12 in,
 4 out, \$nake, mint cond. J Turney, Liberty Au-
 dio, 824 W Broad, Richmond VA 23220. 804-
 788-7008.

Yard consoles (2), 8 input & 2 output, mo-
 no, power chassis missing some tubes, other-
 wise fully working & tested, \$300. Bishop E
 Jackson, WJPC, Waterbury CT 06704. 203-
 573-0554.

Gates Gatesway mono console, working
 when removed, BO, D Tabor, WHCK, Box 158,
 Scottsville KY 42164. 502-237-3149.

Gates Yard recently solid-stated, works OK
 but needs a little TLC, \$150 plus frt; Gates
 President, works OK, needs a little work, \$350
 plus frt. S Sibulsky/J Bjornstad, KVNI, 208-
 664-9271.

Harris Stereo 80 console board, w/weight ste-
 reo chnls in fair cond, \$1000/BO. Jim, Audio-
 com, 8100 Oak Ln#401, Miami Lakes FL
 33016. 305-825-4653.

Spotmaster 88ES100 8 chnl stereo board
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 Camulos Way, Redding CA 96002. 916-222-
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 recorders, excel cond, separate power sup-
 ply avail, \$60 ea or both for \$100 pls UFS
 shpg. B Leslie, Pro Recdg Svcs, 13709
 Mapleleaf Dr, Cleveland OH 44125. 216-662-
 1435.

Arrakis 2100SC, 12 chnl, 34 balanced inputs,
 brand new, \$5000/BO. B Ardis, VoiceWorks,
 4160 W 182nd #208, Torrance CA 90504. 213-
 214-2642.

Auditronics Grandson 110 Series two mo-
 no/mic inputs & stereo line inputs, 8 position
 remote line selectors, all p & g faders, \$3000.
 M Phelps, WLTI, 20300 Civic Ctr, Southfield
 MI 48076. 313-354-9300.

BE AM50 4 channel mono console, vgc, \$500.
 D Moudy, WHLY, 7925 Bayside View Dr,
 Orlando FL 32819. 407-363-1739.

Broadcast Audio System 20, 12 stereo in-
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 stereo outputs, assignable, reud, PS, like
 new cond, 5 remote controls incl, BO. M
 Graziano, Catholic Comm, 1089 Elm St,
 Springfield MA 01089. 413-732-4546.

Clover System 24x16 transformerless,
 \$3000. K Fox, Fox Farm Recording, 1431
 Saundersville Ferry, Mt Juliet TN 37122. 615-
 754-2444.

Harris Mono-5 gd cond, as is, \$600; Harris
 Gatesway-80 (9944-6699-00-4 6413), vgc, as
 is, \$800; Altec 250-SU, 10 ch split stereo tube
 console w/535A pwr sply, some tube cards,
 no tubes, \$2500. J Vengrouskie, Sound-
 scenes, 11700 Old Columbia Pk Ste L-3, Sil-
 ver Spring MD 20904. 301-622-9318.

Harris/Gatesway 80 Solid State mono 8 chnl,
 clean sound, \$600. G Sive, POB 239, Bon-
 sall CA 92003. 619-749-7662.

Harris Stereo-5, working when removed,
 modified w/5534's, no documentation,
 \$800/BO. J Claybrook, WMJJ, 530 Beacon
 Pkwy W Ste 600, Birmingham AL 35209. 305-
 942-9600.

LPB Signature III 8 chnl mono, clean & ex-
 cel cond, \$2750/BO. A Sutton, WMGA, POB
 1380, Moultrie GA 31776. 912-985-1130.

Quantum Labs 12P 12 pot, 18 input stereo,
 in use, gd cond, \$2500. K Thomas, Rebel
 Recdg, POB 207, Atlantic Beach FL 32233.
 704-388-7711.

RCA BC7 (2), 10 chnl 3 inputs per chnl, dual
 chnl mono or can be used in stereo, working
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 S Engelke, WWDJ, POB 970, Hackensack NJ
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Shure Pro Master 6 chnl stereo mixer, great
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Yamaha 1000 16 mixing console, 2 volume
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 Studio, 2001 Elton, Ft Worth TX 76117. 817-
 838-8001.

Yamaha 916 prof mixer, 32 chnls in, 6 subs
 in, 2 effects in/out, 2 echo in/out, 1 cue, 6 mas-
 ter out, mic or line input xlr or line in phono,
 talkback, \$2500. M Legner, 7807 Suffolk Ct,
 Alexandria VA 22310. 703-971-7069.

Want to Buy

Shure M67 mic mixer. J Vukelich, Bcct
 Svcs/MN, 4551 Flag Ave N, Minn MN 55428.
 612-537-1431.

Teac or Tascam, any 8 to 16 input recording
 console w/4 or 8 buss output. B Romonosky,
 WEBQ, Rt 45 South, Harrisburg IL 62946.
 618-252-6307.

Autogram IC-10 & AC-8. Kidd Communica-
 tions, 4096 Bridge St, Ste 4, Fair Oaks CA
 95628. 916-961-6411.

Collins/Autogram 8 chnl stereo Mark 8 or IC-
 8 console in gd cond. J Boyd Ingram, WBLE,
 POB 73, Batesville MS 38606. 601-563-4664.

LPB Signature II, looking for gd, clean used
 8 chnl stereo console, will consider anything
 in LPB line less than 5 yrs old. A Sutton,
 WMGA, POB 1380, Moultrie GA 31776. 912-
 985-1130.

DISCO & SOUND EQUIPMENT

Want to Sell

Dolby A-301 stereo play/recd Dolby Type
 A NR unit w/autotransformer option, vgc,
 \$400/BO. T Steele, Steele Comm, 1697
 Broadway Rm 1404, NNYN 10019. 212-265-
 5563.

MIDI studio equipment: Prophet 2000 sam-
 pler keyboard w/disk library; Akai AX-80 poly-
 phonic synthesizer, Yamaha SPX-90 digital ef-
 fects processor, Korg MR-16 drum sound unit,
 sequential circuits TOM drum machine, all or
 separate, like new, make offer. N Rozanov,
 WCMF, 716-262-4330.

Altec H-803 theater horns, throats & mdl 288
 drivers, \$500/pr; Altec 1215A (2), bass cabi-
 nets, folded horn, 406 drivers, handles &
 casters, \$800/pr. J Vengrouskie, Sound-
 scenes, 11700 Old Columbia Pk Ste L-3, Sil-
 ver Spring MD 20904. 301-622-9318.

Klipsch La Scala's 2 horns, road case, ex-
 terior horn speakers, excel cond, BO. R Kauf-
 man, PAMS Prod, POB 462247, Garland TX
 75046. 214-271-7625.

UREI elec crossover, frame, (4) 518-L & (2)
 518-H cards, w/PS, \$400; Orban/Parasound
 621 parametric EQ, \$425. Pat Appleton Sids,
 305-625-4435.

LIMITERS

Want to Sell

CRL FM-4 System SPP-800, SEP-800, SMP-
 800 & SG-800 w/manuals & original perf.
 measurements, \$4000. K George, WUSY,
 POB 8799, Chattanooga TN. 615-892-3333,
 Fax: 615-899-7224.

VERY TWEAKABLE

You call the shots with this 3-band stereo-FM processor. A wide range of user controls lets you burn a hole in the dial or back it off to totally mellow. Many unusual features - call for blurb.

Inovonics
 (408) 458-0552

Ramko portable mixer PM-42, \$450;
 Thomson-CSF 4500 Presence EQ, never
 used, \$595; CBS-Labs 400 Volumax, good
 buy, \$100. H.M. Dyer Electronics, 2982 Wix-
 om Rd, Milford MI 48042. 313-685-2560.

CBS Audimax III automatic level control,
 \$200; CBS Volumax 400 automatic peak con-
 troller, \$200. K Crosthwait, Rt 5 Box 77, King-
 ston TN 37763. 615-376-5763.

CRL CC-300 composite controller clips over-
 shoots from stereo generator w/documentation,
 gd cond, BO. G Peterson, KIMM, POB
 8205, Rapid City SD 57709. 605-348-1100.

CRL AM-4 3 piece AM processing, excel
 cond, \$2000/BO. C Young, WAYX, 1600 Car-
 swell, Waycross GA 31501. 912-283-1230.

Dorough 610 discriminate audio processors
 (2), mint cond, w/manuals, sold separately or
 as a package, \$2995/both. S Parker, WSJP,
 1500 Diuguid Rd, Murray KY 42071. 502-753-
 2400.

Harris MSP-90 booster/limiter, single site,
 \$1600. D Koehn, KNEN, Box 937, Norfolk NE
 68702. 402-379-3300.

Orban 424A compressor, de-esser, gated
 lin/loq recovery, couple or split operation, new
 cond, \$675. C Wilson, Mongo Video, 13123
 Moldridge Rd, Wheaton MD 20906. 301-949-
 1809.

Orban 8000A & studio chassis, tone controls,
 dual chassis, new caps, \$3500. J Phillips,
 WZOM, 414 Washington, Defiance OH 43512.
 419-782-6986.

Orban 9000A/1 AM Optimod, like new, \$2000;
 Orban 8100/ST studio chassis for split oper-
 ation of Optimod, \$500; Harris ME-1 modu-
 lation enhancer, for MW Series xmters, \$100.
 B Glasser, WHBC, POB 9917, Canton OH
 44711. 216-456-7166.

UREI LA5, similar to LA4, w/rack mt, \$200/BO.
 E Helvey, POB 1357, Winchester VA 22601.
 703-877-1191.

BE AM-400 compressor-limiter, working,
 \$150; Orban Optimod-FM 8000A, \$1200. L Al-
 bert, WKMS, POB 2266, Murray KY 42071.
 502-762-4664.

DAP 310 AGC limiter, \$125. C Leasure,
 WTBO, POB 1644, Cumberland MD 21502.
 301-722-6666.

DAP 310 AGC limiter, \$125. C Leasure,
 WTBO, POB 1644, Cumberland MD 21502.
 301-722-6666.

Gates Solid Statesman AGC (2), BO; Gates
 Solid Statesman FM (2), BO; CBS Volumax
 4000A. BO. B Wilson, WYNA, POB 1407,
 Whiteville NC 28472. 919-642-9131.

Orban 8100A, 2 yrs old & perfect, \$3900. P
 Anderson, KZBQ, Box 97, Pocatello ID 83204.
 208-234-1290.

Orban 8000A plus studio ST from 8100
 w/cards, BO. J Phillips, WZOM, 414 Washing-
 ton, Defiance OH 43512. 419-782-8591.

Orban Optimod 9000A/1 AM processor,
 NRSC ready, manual, excel, \$1800/BO. D Wil-
 ley, Life Bdcg, POB 96, John Day OR 97845.
 503-575-1840.

CRL-FM-4 System, SMP-800, SEP 400, SPP-
 800 w/Aphex aural exciter w/CRL-FM-4, per-
 fect cond, 2.5 yrs w/manuals, \$5000. G Gray,
 WRQR, POB 1546, Greenville NC 27835. 919-
 830-0944.

DAP 310, works great, clean, \$300; UREI LA-
 4, excel cond, \$250. A Sutton, WMGA, POB
 1380, Moultrie GA 31776. 912-985-1130.

EXR Corp EX-IV exciter, gd cond, \$500; Val-
 ley People Dyna-Mite mic processor, dual,
 desk top case, excel cond, \$500. J Claybrook,
 WMJJ, 530 Beacon Pkwy W Ste 600, Birming-
 ham AL 35209. 305-942-9600.

Gates Solid Statesman, gd working cond,
 \$300. S Engelke, WWDJ, POB 970, Hacken-
 sack NJ 07602. 201-343-5097.

Harris MSP-90, MSP-95 FM audio proces-
 sor/stereo generator, triband AGC, FM peak
 limiter, stereo, BO. G Nicholas, KXIC, I-80 at
 N DuBuque St, Iowa City IA 52241. 319-354-
 9500.

Home made stereo comp/limiter, \$135. J
 Klauk, KFM Bdcg, 118 Bay, Glens Falls NY
 12601. 518-792-9290.

Orban 8000A factory upgrade & realigned,
 \$1800; Gates Solid Statesman FM (2), \$150.
 M Ripley, KOZE, POB 936, Lewiston ID 83501.
 208-743-2502.

Orban 8000A optimod, perf cond, \$2000. J
 Phillips, WZOM, 414 Wash, Defiance OH
 43512. 419-782-8591.

Orban XT-2 Chassis, excel cond, approx 4
 yrs old, \$900. J Hartmeyer, WCLT, POB 880,
 Newark OH 43055. 614-345-4004.

Texar Audioprism w/AM limiter, excel cond,
 includes xmt phase corrector, \$1500. K
 Storm, POB 40554, Washington DC 20016.
 301-953-0855/0747.

UREI LA-3A, prod compressor/limiters (2), ul-
 tra mint cond w/manual & rack mount kit, new
 T4B's, BO. R Kaufman, PAMS Prod, POB
 462247, Garland TX 75046. 214-271-7625.

MICROPHONES

Want to Sell

Bruel & Kjaer 2801 condenser microphone
 power supply for B&K tube type mics to trade
 for a Sony C-37A power supply, E O'Brien,
 Imperial Snd Sds, RR31 Box 405, Terre Haute
 IN 47803. 812-877-2663.

MISCELLANEOUS

Want to Sell

Rack, 72" & 19" standard across w/wheels; Ampex mixer MX35 & xformers; Patch bays (4) single inputs & cords; Altec mixers 1567's & xformers; Lafayette audio gen & Heath oscilloscope; Rekokut turntable CVS12 variable speed 25-100RPM's; Ampex 620 sprk-amp; Daven attenuators panel of 8; Presto 6N lead screws. Call Mr. Oliver, 212-874-7660/0274 (PMs).

Dialight 3/4 bezel mounts & 3/4 switch lenses for 513 Series switches, 1/2 price. J Nickel, KJSC, POB 99, Columbus NE 68601. 402-564-2891.

Extel AH II R printer, \$400/offer. D Koehn, KNEN, Box 937, Norfolk NE 68702. 402-379-3300.

Jack strip, 52 RTS, dbl closed circuit jacks, gnds normalled, gd cond, \$50; Line xmrs (2) EV 502, EV 502B, Shure A86A, \$12.50 ea/ail for \$40; Pioneer JA-R102 rk mnt adaptor kit, \$7. E Helvey, POB 1357, Winchester VA 22601. 703-877-1191.

RCA 33A jack panel; 63B & 61B mica capacitors, make offer. B Kidd, Airwaves, Media Sales, POB 976, Rayville LA 71269. 318-728-4574.

Western Electric patch panels, wire wrap or solder type TRS, normalled, great for stereo, 3 rows, 7" rack space, \$35 plus shpg. R Kerbaw, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

Wilcox-Gay Recordio 5A20 disk recorder, BO, D Ibel, KICD, 2600 N Highway, Spencer IA 51301. 712-262-1240.

150/300 & 600/800 Daven or Shallco stereo attenuators out of non-operating equip; Surplus programs for Tandy 6000 computer, 8" TRS-DOS or Xenix, very reasonable. O Morrison, KUAD, 600 Main, Windsor CO 80550. 303-686-2791.

Battery chargers, electronically regulated for 24 volt storage batteries (2), one 25 amp, \$150, one 30 amp, \$175. F Portnoy, 603-267-7331.

Cannon UA Series, assorted male, female, cable & panel microphone connectors, BO, B Humpherys, Utah State Univ, Logan UT 89322. 801-750-3133.

Cart rack, walnut formica, holds 60 carts, new, \$60/BO. P Wolf, 813-574-5548.

Christie Reflex 20 mdl D6A06 battery pulsing charger for Christie eng battery packs, make offer. M Garrett, WCIA, 509 S Neil St, Champaign IL 61820. 217-356-8333.

Collins P/N 662-0213-000, \$270. C Leasure, WTBO, POB 1644, Cumberland MD 21502. 301-722-6666.

Enterprise Elect 7900 color weather radar system to use w/data from Nati Weather Svcs, BO, L Dupree, KSKL, 1115 Texas Ave, Alexandria LA 71301. 318-445-1234.

Henry Syncro Start, never used, \$100; LEL IF611 timer interface for cart machines & turntables; Extel printer mdl AH11R, needs head & belt; 16" turntable; 10" R-R tapes, \$5.00 ea; (2) Hazeltine 1500 terminals mdl 4DT155207, A Wortmann, WJAG, 309 Braasch, Norfolk NE 68701. 402-371-0780.

Kintronics RFC40-20 RF contactor, never used, \$450. D Tabor, WHCK, Box 150, Scottsville KY 42164. 502-237-3149.

Large quantity of equipment: Neumann, Scully turntables; BGW, Haeco, Dynaco amplifiers; Soundcraftsman, Dolby, dbx audio production gear; MCI, Sony, Inovonics, Ampex, Sanyo, Scully cassette & R-R recorders; test equipment; disco & sound equipment and more miscellaneous pieces to numerous to print. Call for information & prices. Tom Steele, Frankford/Wayne Mastering Labs, 1697 Broadway, NY NY 10019. 212-265-5563.

Lorain rack-mount telephone repeaters, will fix line loss in dial-up lines (7) w/shelf, as new, \$200 plus frt; Universal data systems (Motorola) 202T data modem, RS-232 to RJ-11C, \$100 plus frt. D Gilliam, 1555 W Pampa, Mesa AZ 85202. 602-839-1901.

LP's & 45's, A/C, top 40, 60's, 70's, & 80's, mint cond, \$245's & \$6/LP's. P Wolf, 813-574-5548.

Soft SPS400A uninterruptable power supply, 400VA, internal battery, terminals for external 24Vdc, \$350. F Portnoy, 603-267-7331.

Regulated power supplies (3), 2 ea Lamda plus/minus 12-15 volts at 1.4 amps. One needs minor repair, \$20 & \$10; (1) Lambda tube type model 0-324, 230-300 volts at 150ma, works OK, rack mount, \$50/BO. M Gottesman, KSGT, POB 100, Jackson WY 83001. 307-733-2120.

Regulated power supplies (3), 2 ea Lamda plus/minus 12-15 volts at 1.4 amps. One needs minor repair, \$20 & \$10; (1) Lambda tube type model 0-324, 230-300 volts at 150ma, works OK, rack mount, \$50/BO. M Gottesman, KSGT, POB 100, Jackson WY 83001. 307-733-2120.

Teledyne thermoelectric generator, new 70 watt for remote power source, BO, D Barton, KMTI, POB K, Mont UT 84642. 801-835-7301.

Time & Temperature System, digital, 5 line ready, but expandable, gd money maker or PR vehicle, hear on line at 605-343-7300. D Grant, Willow Creek Bldg, 8601 Woodland Dr, Black Hawk SD 57718. 605-787-4805.

1976 Chrysler mobile studio, custom, all Lexan bdct mobile studio, incredible visability, \$12,500. M Esberg, WVMT, Box 620 Malletts Bay Ave, Colchester VT 05446.

Aerovox 9205 large degausser, \$100/BO; (2) VU meters, gd cond, \$30 ea. HL Sewell, Oakridge Studio, 2001 Elton, Ft Worth TX 76117. 817-838-8001.

Elco ST-70, \$150. J Vengrouskie, Soundscapes, 11700 Old Columbia Pk Ste L-3, Silver Spring MD 20904. 301-622-9318.

Executone K21000 electronic phone system, \$1000. G Jacques, KSLX, POB 1827, Scottsdale AZ 85252.

Info on doing freq searches (the old way) w/maps, table, etc., for AM & FM; Info on tower erection, guying etc, anything dealing w/tower structures; old engineering proceedings, both NAB & SBE. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

John Wiley & Sons, Inc, Pub: Frequency Modulation Engineering by CE Tibbs & CG Johnstone; McGraw-Hill: Modulation, Noise & Spectral Analysis by PF Pantor, R Meyers, Benchmark Comm, 4700 SW 75 Ave, Miami FL 33155. 305-264-5963.

Ten line rotary telephones, w/intercom, connector, \$15 ea. M Black, 315-789-8970.

LEL/Dale 200 splitters/combiners for stereo/mono (10), \$20/ail; Apple IIE, new system w/2 bal disc drivers, 80 column card, RCA 9" monitor, \$400. P Russell, Boudoin College, AV Services Sills Hall, Brunswick ME 04011. 207-725-3066.

Manual for CBS Mdl 450 dynamic presence EQ; junk FM xmtr, prefer 1 kW or less; junk STL xmtr or rcvr; 6th edition of NAB engineering handbook. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

Manuals for McMartin TBM 2500 RF amp, McMartin TBM 3500 mod mon, Gates CB77 turntables, Gates Level Devil agc amp, Garron STE-100 stereo phase enhancer. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

Stencord 83 18 dictators w/microphones & 6' pedals, uses mini-cassette, vgc, \$95PP. L Grazioplene, Macrotec, 3532 N Main, N Java NY 14113. 716-535-7251.

Switchcraft (10) new 48 input patch bay, \$30 ea. C Elmajian, Tri-Core Rec., 27503 Five Mile Rd, Livonia MI 48154. 313-427-8784, before 2PM.

Tandy mdl II computer, keyboard, 3-drive expansion bay, BO over \$700; 1975 Coachman 22' camping trailer converted to mobile unit, tandem axle, (2) TT's, console, internal & external sockets, AM/FM monitor, heat/air cond, range, refrigerator, BO/\$3300. Jeff Sigmon, WBZK, 803-684-4241.

Wegener cards for SMN Starstation format; program card only for SMN Country, \$500 per card. J Buffington, WVWZ, POD 1240, Aberdeen MS 39730. 601-389-4561.

Radio Network pulse receiver, never used w/manual, \$200. B Wittnebel, KRIB, POB 1568, Mason City IA 50401. 515-424-1490.

Want to Buy

1410 kHz crystals wanted, to fit Gates BC 1-G xmtr & CSI (CCA) T2.5A xmtr. J DeVan, WZAL, 12 N Cedar, McDonough GA 30253. 404-957-1549.

Broadcast pins or buttons, network, olympic, etc. M Black, 315-789-8970.

Early mono Hi-Fi equipment, Fisher, MacIntosh, Scott, etc. Looking for Scott 121-Series preamp, also related literature and/or Audio Engineering & Hi-Fidelity magazines. B Leslie, Pro Recdg Svcs, 13709 Mapleleaf Dr, Cleveland OH 44125. 216-662-1435.

Floppy drive for an Apple 2E & 80 col cd (extended). J Schloss, KICD, 2600 Hiway, Spencer IA 51301. 712-262-1240.

Jazz record collections, 10" LP/12" LP bebop, swing, dixie, highest prices paid. B Rose, Program Recdgs, 228 East 10th, NY NY 10003. 212-874-3060.

WE 310B copy of schematic or any information. R Delius, WFXC, 2515 Apex Hwy, Durham NC 27713. 919-596-2000.

Broadcast pins, Olympic, network insignia, station logos, etc, for collection. M Black, WEOS, Geneva NY 14956. 315-789-8970.

Bulk tape eraser suitable for 14" audio tape in all reel sizes. RL McDonald, Mission Recdgs, 5231 Horton, Mission KS 66202. 913-722-2677.

New Class A FM at Lake Tahoe needs everything! Consoles, cart machines, Optimed, remote control, STL & xmtr. Kidd Communications, 4096 Bridge St, Ste 4, Fair Oaks CA 95628. 916-961-6411.

Schematic for DuMont 347 oscillator. P Robillard, Highway 79 N, Haynesville LA 71038.

MONITORS

Want to Sell

McMartin 4500A stereo mod monitor, excel cond; rack mt fixed freq AM rcvr; TBM-3500, TBM3000 & RF amp, \$1500/BO. J Phillips, WZOM, 313 Washington, Defiance OH 43512. 419-782-6986.

RCA BW-66F tube type AM modulation monitor, BO, B Glasser, WHBC, POB 9917, Canton OH 44711. 216-456-7166.

FM receiver module for TFT-760 EBS unit, tuned to 102.9 MHz, \$275. M Patton, WXON, 6819 Cezanne, Baton Rouge LA 70806. 504-292-4189.

TFT 760, new caps, works fine, EBS system, \$500 firm. L Albert, WKMS, POB 2266, Murray KY 42071. 502-762-4664.

Parts for McMartin TBM 2200 stereo mod mon; McMartin TBM 3500 mod mon; Gates Diplomat console; McMartin TBM 4000 mod mon; RCA BTE10C exciter, crystal oven; RCA BTS 1A stereo generator, low pass filters. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

Potomac PM112.3 tower antenna monitor; BO; Collins 900F-1, 900C-1 FM mod mon & 67 kHz SCA monitor, BO, K Stokes, WKJN, 3029 S Sherwood Forest Blvd, Baton Rouge LA 70816. 504-295-1832.

QEI 691 calibrated 3/89 by QEI, \$3500. M Phelps, WLTI, 20300 Civic Ctr, Southfield MI 48076. 313-354-9300.

RCA (Belar AM-1), works great, has lights for 100 & 125 percent peaks, \$500. A Sutton, WMGA, POB 1380, Moultrie GA 31776. 912-985-1130.

Want to Buy

McMartin TBM-4500A or 3500B, 220A, working not necessary. Goodrich Enterprises, 11435 Manderson, Omaha NE 68164. 402-493-1886.

FM stereo mod meter, any brand in gd cond. L Amstutz, Lumiere Haiti, 4526 Arlington, Ft Wayne IN 46807. 219-429-8366.

MOVIE PRODUCTION EQUIPMENT

Want to Sell

Arriflex 16-BL w/12-120mm Ange. Lens, matte box, Cine 60 battery belt, 2-400' Mags, Miller F.H. tripod w/Cine 60 snap-loc. Spectra Light meter, Arm shoulder pod, B & S dolly, changing bag & many filters. 12 yrs old, light use, well maintained. Please bid via VAX 203-322-4993, North Star Audio Video Corp.

Kodak 7231, 7291, 7292, 5247, 5294 film stock, 16mm & 35mm in 100', 400', 1000'; KEM universal 8 plate 16mm & 35mm film editing tbi w/heads & screen. J Workman, Maritz, 600 W Lafayette, Detroit MI 48226. 313-963-1200 X501.

DeVry PH-405 (2), mint 35mm portable projectors, ext tube amps & spkrs, reels, lamps, access, \$1800/ea or \$3200/pr. J Vengrouskie, Soundscapes, 11700 Old Columbia Pk Ste L-3, Silver Spring MD 20904. 301-622-9318.

RECEIVERS & TRANSCEIVERS

Want to Sell

Johnson FM 588 UHF handheld & charger, vgc, \$425; ISS GL5000 satellite receiver, TV & monitor out, new, BO, J Corcoran, KWWW, POB 638, Wenatchee WA 98801. 509-662-7135.

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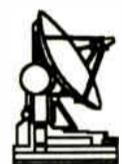
National Co Type NC-2-40CS comm receiver, 200 to 33,000 kHz tuning, gd cond, \$150. R Majestic, Otic Inc, 2117 Bay Front Terr, Annapolis MD 21401. 202-485-6228.

Phelps-Dodge PD-7660 6 cavity mobile duplexer 435-470 MHz, will handle 40 W, \$100; GE Exec II mobile, low band 30-36 50 watt, will tune 10 meter FM for simplex or split out to make repeater, \$75; Motorola Director VHF tone & voice pager w/recds & charger, \$75. P Russell, Bowdoin College, Sills Hall, Brunswick ME 04011. 207-725-3066.

Wegener Transtar-Country, changed formats, this unit used less than 6 mos. C Harrison, Boise Viking Assoc., 5601 Cassia, Boise ID 83706. 208-344-3511.

Wilson WE-800, 144-148 MHz, synthesized FM transceiver, 1W/12W, 12 VDC or internal NiCad batt w/spkr-mic & hand-tooled leather case, mobile mnt, \$200; ICOM IC-280, 144-148 MHz synthesized FM transceiver, 1W/10W, 3 memory positions, 12 VDC, mobile mnt, \$200. E Helvey, POB 1357, Winchester VA 22601. 703-877-1191.

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Aircraft Skyphone, \$300; mobile VHF power amp, max 30 watts in, 80 watts out. C Hayes, POB 31235, Jackson MS 39206. 601-948-1515.

CSI Private Patch III simplex, semi duplex phone interconnect, like new, \$200. P Russell, Boudoin College, AV Services Sills Hall, Brunswick ME 04011. 207-725-3066.

Harris mdl 6550, satellite rcvr chassis, excel cond, w/manuals, \$1000/BO. R Fass, WLRB, 119 W Carroll, Macomb IL 61455. 309-833-5561.

Motorola TLD 1220A 20 watt IMTS mobile phone w/all crystals control head, antenna & cables w/manual, \$400. D Bailey, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

Motorola Pulsar II VHF, IMTS/Bell phone w/MACS option & antenna, Pulsar II head, manuals, \$675. J Thornton, KZSC, 2336 Webster, Berkeley CA 94705. 415-540-5236.

TFT 760 EBS rcvr, AM rcvr module 760-01, FM rcvr module 760-02. V Thompson, KTOT, Box 2810, Big Bear Lake CA 92315. 714-866-3434.

Want to Buy

Realistic Pro 2 monitor receiver, need owners manual & crystals to fit it; Commodore 64 computer, working or not. C Daniel, Daniel Electronics, Rt 4 Box 336E, Mena AR 71953. 501-394-6654.

REMOTE & MICROWAVE EQUIPMENT

Want to Sell

Equatorial/MPI, complete UPI satellite news setup including dish/LNA, controller & printer, gd cond, BO, G Peterson, KIMM, POB 8205, Rapid City SD 57709. 605-348-1100.

Harris 6528 satellite rcvrs, vgc, have approx 60, will make deal on package, \$1000 ea/BO. R Dieterich, WAMO, 411 7th Ave, Pgh PA 15219. 412-471-2181.

Modulation Assoc., analog satellite rcvr, make offer. J Evans, KNIT, 75 Fourth, Lakeport CA 95453. 707-263-1551.

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World Radio History

REMOTE . . . WTS

Moseley SC68 subcarrier generators, 67 kHz, 185 KHz. Brand new, \$900; Moseley SCD, 185 KHz, brand new, \$900. J Evans, KNTI, 75 Fourth, Lakeport CA, 95453. 707-263-1551.

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Moseley PCL 2B dual STL system, (2) xmtr, (2) rcvrs, you ship, \$2500/BO. R Dietherich, WAMO, 411 7th Ave, Pgh PA 15219. 412-471-2181.

Moseley PBR-30A 30 chnl remote control w/2 studio terminals, working when removed, will work duplex or simplex, \$500 as is. C Gustafson, WKZO, 590 W Maple, Kalamazoo MI 49008. 616-345-2101.

Terracom TCM 601F microwave receiver, gd cond, w/case, \$2200; ITT/Federal MIL Spec, portable microwave 12 line telephone/telegam system, gd cond, \$7800. M Murphy, 11621 Valle Vista Rd, Lakeside CA 92040. 619-561-2726.

Belar remote frequency, modulation & peak flasker panel, \$75/BO. P Russell, WBOR, Sills Hall, Brunswick ME 04011. 207-725-3066.

Enterprise WR-100-5 weather radar w/digital NTSC colorizer, 8' steerable antenna w/dome, 550 kW peak output, with/without 100' self supporting tower. D Roden, 1701 Monte Sano, Huntsville AL 35801. 205-533-3676.

Marti RPT-25 xmtr on 450.75/450.65, new cond, \$1300/BO. M Black, WEOG, Geneva NY 14456. 315-789-1929.

Marti SCG-8 sub carrier generator tuned to 67 KHz, can be returned, \$350. M Patton, WXON, 6819 Cezanne, Baton Rouge LA 70806. 504-292-4189.

Marti SCG-8 sub carrier generator tuned to 67 KHz, can be returned, \$350. M Patton, WXON, 6819 Cezanne, Baton Rouge LA 70806. 504-292-4189.

Moseley PBR 15AR PC boards: TU, sub aud mtr proc 51A5327, sib carr demod 51A5331, sub carr gen 51A5320, alarm xmt 51A5335; SU: sub aud up conv 51A5315, sub carr gen 51A5320 (110 Kc pref), alarm det 51A5322. V Thompson, KTOT, Box 2810, 575 Pine Knott, Big Bear Lake CA 92315. 714-866-3434.

Moseley PBR-21 remote control system, \$800. C Leisure, WTBO, POB 1644, Cumberland MD 21502. 301-722-6666.

Moseley PCL-303 STL on 947.0, \$2000; Moseley SCA generators (2) & demod, \$450/all. M Ripley, KOZE, 2560 Snake River. 208-743-2502.

Moseley PCL-505, (2) xmtrs, (2) rcvrs, gd cond on 947.875/948.125, no combiner, \$2500. P Baumgartner, WMBD, 3131 N University, Peoria IL 61604. 309-688-3131.

TFT 7610-C digital telemetry remote digital remote, wireless, remote control, needs work, BO. J Bahr, WVIS, Box 487, Frederiksted, St Croix, US Virgin Islands, 00841. 809-778-5199.

Marti RPT-2S, 25 watt RPU xmtr, new cond, \$1200/BO; Comrex LXR single line freq extension decode, \$350/BO; WE KS-20159L4 line EQ, gd cond w/cases (2), M Black, WEOS, Geneva NY 14956. 315-789-8970.

Moseley PCL-303 STL xmtr & rcvr, \$2000; Moseley SCA generators (2) & a demodulator, \$450. M Ripley, KOZE, POB 936, Lewiston ID 83501. 208-743-2502.

Moseley PCL-505/C composite STL rcvr & xmtr, gd cond, tuned to 9470 MHz, approx 12 yrs old, w/manuals, \$3800/BO. J Knudsen, KWDJ, 7351 Lincoln, Riverside CA 92504. 714-688-1570.

Scala Minifactor STL antennas (2), very little use, \$500. S Callahan, WFTI, 1120 Pinellas Bayway #103, Tierra Verde FL 33715. 813-866-3544.

Telefax 131A mixer w/all access in new cond, \$450; Scientific Atlanta 75 kHz dual audio decoder, new, \$1200; Marti 30/150 RPU rcvr on 161.70 MHz, BO. KA Lancaster, WRFS, POB 5523, Falmouth VA 22403. 703-373-4640.

Wegener/Satellite Music Network complete sat rcvr for SMN oldies chnl, perfect cond, \$2000; Elgin, W-E auto answer couplers for telephone line (12) type 20271 & 19522, work & snd cond, \$65 ea. G Nicholas, KXIC, I-80 at N DuBuque St, Iowa City IA 52241. 319-354-9500.

Want to Buy

Ampex 400B remote control. C Wilson, Mon-go Video, 13123 Moldridge Rd, Wheaton MD 20906. 301-949-1809.

Scientific-Atlanta digital audio terminal power supply. C Gustafson, WKZO, 590 W Maple, Kalamazoo MI 49008. 616-345-2101.

Marti RPT-15 450 MHz, also need matching rcvr. J Davis, WGRD, 38 W Fulton, Grand Rapids MI 49503. 616-459-4111.

Moseley PBR-15 w/110KHz SCA return, must be in gd working & cosmetic cond. J Bahr, WVIS, Box 487, Frederiksted, St Croix, US Virgin Islands, 00841. 809-778-5199.

Remote control for Am 1000W, telephone lines only. J Foust, WXEE, POB 1340, Welch WV 24801. 304-436-4191.

Strapping diagram for WE & KS20159-L4 EQs. M Black, 315-789-8970.

Working VHF RPU & STL equip needed for 169 & 217 MHz bands. L Amstutz, Lumiere Haiti, 4526 Arlington, Ft Wayne IN 46807. 219-429-8366.

Composite type microwave sys for 949 MHz band & for stereo oper, need everything from antennas to xmtr/rcvrs. B Coleman Jr, WIST, Box 460, Lobelville TN 37097. 615-593-2294.

Symetrix TI-101 telephone amp/EQ, new or used. R Fess, WLRB, 119 W Carroll, Macomb IL 61455. 309-833-5561.

STATIONS

Want to Sell

Daytime Midwest 1 kW AM, located on 12A, includes new 3000 sq ft studios, near major market, financing available, \$380,000. Goodrich Ent Inc, 11435 Manderson St, Omaha NE 68164. 402-493-1886.

FM CP's WANTED

Clients seek CP's any size market. Small, medium, large. Will consider FM upgrades, too!

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Will sell up to 45% of 10 kW AM under construction in SW Montana. Station will serve Bozeman, Butte, Helena, Dillon & Livingston, plus NE Idaho & Yellowstone Natl Park. Also unopposed FM application for Class C now before FCC. Golden Empire Bdctg, POB 483, Belgrade MT 59714.

AM 1kW, large Colorado mkt, low down, low price. G Erway, 3450 SE Martinique Trace, Stuart FL 43997. 407-283-6871.

FM near Augusta ME. Excel mkt of over 65K, area is No.1 in retail sales, amazing signal at 980' ASL, more power soon, \$295K cash, D Tallyn, Dark Comm, 300 N Fig Tree Ln, Plantation FL 33317.

Full time AM CP, 5000 W non-directional days, 500 W directional nights, in county adjacent to a top 50 mkt, can move to that county border & increase power to 50 kW. Serious inquiries only to POB 40333, Nashville TN 37220.

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for availabilities. Phone 800-336-3045

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STATIONS . . . WTBS

Looking for AM, FM or CP in east for right price/terms. H Kozlowski, 703-631-0197.

STEREO GENERATORS

Want to Sell

Wilkinson SG1E stereo generator. E Kazmark, KAPA, 2085 Ocean, Raymond WA 98577. 206-875-5551.

Onan 15RJC-4R8/5700 P, 15 kW stand-by/18.75 kVA AC 120/208 3 phase 60 Hz 1800 rpm natural gas, \$2000. L Vidoli, WEEI, 4450 Prudential Twr, Boston MA 02199. 800-654-6038.

Urban 8000A processor/generator, \$1200 C Leasure, WTBO, POB 1644, Cumberland MD 21502. 301-722-6666.

Wilkinson SG1E, Collins 786M-1 solid state generator, \$750 & \$400 respectively. J Bahr, WVIS, Box 487, Frederickstad, St Croix, US Virgin Islands, 00841. 809-778-5199.

Harris stereo generator for MS-15 exciter. B O'Connor, KDES, 821-N Palm Cyn, Palm Springs CA 92262. 619-325-1211.

Wilkinson SG-1, working when removed, BO/trade. M Koscak, WSKB, Western Ave, Westfield MA 01085. 413-562-1950.

SWITCHERS (Video)

Want to Sell

EchoLab SE2 video switcher w/sync generator, gd cond, \$800. D Harns, Design Stds Teleprod, 216 Commercial, Waterloo IA 50701. 319-232-5604.

Routing switcher, 100 in, 96 out. GE TS301A recently retired from service, gd working order wall cables, manuals, racks, BC. A Ezekiel, 215-848-4501.

Cohu 9501 8 input SEG, w/6 wipes, int-ext keyer, mix function, w/manual; Telemation TSG-300GL genlocking color sync gen, \$500/both. TFG, Box 9, Wethersfield CT 06099. 203-527-2972.

Grass Valley 1600-4S master control switcher w/stereo audio, M202 preroll machine control, downstream keyer, 15 m cables, \$30,000. R Rickly, WUAB, 8443 Day Drive, Cleveland OH 44129. 216-845-6043.

ISI 902 10 inputs, 2 ME, 8 rotary wipes positioner, pgm & preview outs, gd cond, \$1100. D Lahey, Pathfinder Prod, 10794 McGuffie, Salinas CA 93907. 408-663-5192.

TAPES, CARTRIDGES & REELS

Want to Sell

3M 1/2" tape, 206 (12) full, (2) partial hubs, 208 (1) full hub, Ampex 406 (1) full hub, \$5 per hub; (2) 1/2" metal 10" reels, \$3 ea. Entire lot, \$75. E Helvey, POB 1357, Winchester VA 22601. 703-877-1191.

Ampex, Maxwell brands, one lot of 59 KCA type video cassettes, BO. E Meier, Rt 4 Box 98, Washington NC 27889. 919-946-2461.

Capitol, Fidelipac, various lengths & recorded songs, \$1 ea. R Price, KWIK, Box 998, Pocatello ID 83204. 208-233-1133.

IGM pre-recorded tape, 30 reels 14 in 2 tr stereo, big band music, \$30 per reel in US. F Anderson, 3801 Fifth Ave South, Great Falls MT 59405. 406-452-2810.

Record collection, 45 RPM, Neil Diamond, Supremes, Beach Boys, etc. 1960-1980, approx. 500 records, make offer. C Zalwski, Eds Comm Svcs, POB 92, Johnson City NY 13790. 607-798-7111.

A&D Cartridge Rebuilding Service

We clean, load & pack. Serviced within 10 work days! Work guaranteed!

3380 Daley Ave., Eau Claire, WI 54701
(715) 835-7347

Ampex VPR-1C (2) 1" tape machines w/TBC2, excel cond. D Roden, 1701 Monte Sano, Huntsville AL 35801. 205-533-3676.

Aristocats, various lengths, sale or trade. Clay Freinwald. 206-383-9700.

ABCO 500 lazy susan cartridge rack, holds 500 carts, 6" high 21" diameter, gd cond, (2), \$400 ea. E Swanson, WZTR, 520 W Capitol, Milwaukee WI 53212. 414-964-8300.

Fidelipac Mdl 300, 40's-70's-100's, etc, over 500 carts, most like new, \$2 ea pls shpg. WCMT, POB 378, Martin TN 38237. 901-587-9526.

Fidelipac Master carts (1000) useable, 2.50 & 3.50 min in length, 60" ea, add \$3 per 100 carts for shpg. D Pelusc. KFM, POB 15223, Las Vegas NV 89114. 702-732-7753.

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Fidelipac & Audiopak, over 150, misc lengths, gd cond, \$1 ea. M Gellos, Pensacola Christian College, 904-478-8480.

Several hundred 7" & 10" metal & plastic reels, boxed & unboxed, make offer. M Gellos, Pensacola Christian College, 904-478-8480, X5041.

EMPLOYMENT

To place ads in this section, use the ActionGram form. To respond to box numbers, write: Radio World, PO Box 1214, Falls Church, VA 22041, Attn: _____

POSITIONS WANTED

Broadcast school graduate, single female, seeks announcing, audio/video production position, gen ph., some experience, will relocate. Linda, POB 1025, Cedar Rapids IA 52406.

Broadcaster, etc., Vietnam vet, American Forces Radio, native american Indian, needs work. 10 yrs experience. Ralph Nabor, 2342 Harwood St, LA CA 90031. 213-223-2799.

Central Florida DJ, successful entrepreneur, over 10 yrs experience all facets of broadcast, seeks employment near Mt Vernon MO. Reply #70 713 Rose St, Auburndale FL 33823.

CHR-UC air personality or music director seeking employment in AM & FM markets. Willing to relocate. For resume and aircheck contact James Torres, 3933 Main, E Chicago IN 46312. 219-397-4261.

Director of Engineering for one of America's top rated, best sounding radio stations, is looking. Hands on, very strong audio & RF, 18 yrs exper. NARTE, SBE & FCC. Reply to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box 3-89-4RW.

Engineer, 24 yrs exper, NARTE, SBE, FCC general, all phases of radio, seeks position with radio group or medium market combo. Prefer S.E., excel references. Write to Radio World, POB 1214, Falls Church VA 22041. Attn: 3-89-1RW.

Engineer, 22 yrs exper all phases AM/FM bdcet engineering including extensive station construction, seeks position as station or group CE or manufacturers sales representative. Patrick Shirley, POB 292, Mumfory NY 14511. 716-538-2976.

FT contract engineer (AM/FM) seeking position for TX, OK, ARK, LA area, SBE certified/bdcet eng AAS degree. B Gaddis, 1302 E First St, Mt Pleasant TX 75455. 214-572-9322.

Talented, versatile announcer, 11 yrs exper., looking for work. CW format, NW North Carolina, SW Virginia preferred. R Wisbon, Route 1, Box 545, Yadkinville NC 27055. 919-679-2379.

AM, FM, TV Chief, 30 years experience seeking responsible position in broadcast engineering management. D Larsen, 4554 South 35th West, Idaho Falls ID 83402. 208-524-7260.

Engineer, mature, extensive exper in AM/FM, shortwave and TV. General phone, NARTE, BSBA degree. Prefer sunbelt, consider all areas including overseas and equipment manufacturers. Write to: Radio World, PO Box 1214, Falls Church VA 22041. Attn: Box 4-89-1RW.

FT radio CE position wanted. Experience in AM/FM radio, professional audio systems, computers; design, installation, maintenance. B.S. degree in engineering; FCC license. mid-west or south preferred. Call Andy at 508-393-5753, evenings before 10PM.

Program Director/announcer w/B.A. in Communications. 6 yrs exper, have done engineering. James, 608 College Ave, Bluefield WV 24701. 304-327-5651.

Take charge VP/GM available for your radio station. NE, Oklahoma area. Stable, professional, creative. Write to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box 4-89-3RW.

Voice talent wants stable east, west, gulf coast college fine arts radio position. 20 yrs classical, commercial exper. Joel Newman, Box 7703, Atlanta GA 30357.

CE NBN, NJ College radio station, FCC, NARTE, NABER, general radio license seeks FT/PT employment. M Rakoff, 11441 Queens Blvd Ste 148, Forest Hills NY 11375. 718-591-0002.

Chief w/20+ yrs in radio seeks new challenges. Exper to 50K AM, 100K FM, DA, construction, maint & more. K Bass, Osage Bdcg, 2819 N Orchard, Roswell NM 88201. 505-622-4713.

Engineer w/20+ yrs exper, all phases of radio, excel references. For more information & references call Cecil, 817-656-1318.

Experienced combo ENG/Anchor, user friendly school of hard knocks, trained bottom line orient. Aggressive audio, Texas AM/FM TV entry level. P McKaig, Rt 4 Box 18299 # 29, Alice TX 78332. 512-664-1106.

Morning Team w/zest ready to do the best, call Sam for demo tape, 501-225-6529.

SD air personality seeks position on air. Preferably in 5 state area of FL, 5+ yrs exper, dependable & reliable. BC Songrudi, Box 75, Revillo SD 57259. 605-623-4543.

HELP WANTED

Engineer, for new 50 kW FM CBS affiliate, Eastern NC needs hands on engineer. Emphasis on studio, satellite & keeping station on air. Must like equipment & people. Team player who can pull air shift. EOE. 919-261-3772.

Broadcast chain needs CE for 100 kW FM, 5 kW AM, and multi-track production facility on the sunny Gulf Coast. Complete hands on ability for transmitter, studio maintenance and construction. A dream of a plant with all new equipment. E.O.E. Rush resume to The Dittman Group, PO. Box 1248, Mobile, AL 36652.

Engineering Contractor for new 50 kW FM CBS affiliate w/satellite. NC Coastal area. State of art xmtr, equipment. Weekly maint., & capable handling unforeseen emergency. Efficiency & car imperative. Station seeking staff technician to support/coordinate w/contractor. EOE. 919-261-3772.

Group needs engineers, AM DA & FM to turn around stations technically, SBE cert a plus. Write to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box 4-89-2RW.

Station Manager, Eastern NC 50 kW FM seeks progressive, organized professional w/solid business/sales background. Hands on radio ability & team leader. Potential for GM. EOE. 919-261-3772.

Well-known New Age radio host, Joyce Keller. Advice, interview format. Proven ratings winner. Entertaining, therapeutic, informative, currently on Natl TV seeks radio hosting position. 516-587-2013.

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WGCI-AM/FM seeks exper bdcet main tech. Candidate should be skilled in system & device level construction, troubleshooting & repair of studio audio control logic, xmtrs, transmission lines & remote control. Desirable add'l skills: structured high-level programming, digital audio & storage media, control logic design, audio design, microwave systems & two-way systems. EE or hrs toward, SBE cert, Comm and/or Amateur licenses a plus. Resumes to Frank McCoy, WGCI, 332 S Michigan Ave, Chicago, IL 60604. EOE/M/F/H.

ACTION-GRAM

EMPLOYMENT SECTION:

Help Wanted: Any company or station can run "Help Wanted" ads at the flat rate of \$25 per listing per month (25 words max). Payment must accompany insert; **there will be no invoicing.** Blind box numbers will be provided at an extra charge of \$2. Responses will be forwarded to listee, unopened, upon receipt. Call 800-336-3045 for display rates.

Positions Wanted: Any individual can run a "Position Wanted" ad, FREE of charge (25 words max.), and it will appear in the following 3 issues of Radio World. Contact information will be provided, but if a box number is required, there is a \$2 fee which must be paid with the listing (**there will be no invoicing**). Responses will be forwarded to the listee, unopened.

Check as appropriate:
 Help Wanted With Box Number
 Positions Wanted Without Box Number

Text (25 words maximum): _____

Name _____ Title _____

Company/Station _____

Address _____

City _____ State _____ Zip _____

Telephone _____

Mail to:
BROADCAST EQUIPMENT EXCHANGE
PO Box 1214, Falls Church, VA 22041

ADVERTISING MANAGER Broadcasting Equipment

Broadcast Electronics seeks a creative individual to direct the company's total product promotion and space advertising program. Position reports to VP/Marketing. Minimum requirements 2 years industrial product merchandising experience and BS or MS degree, preferably in journalism. Applicant must possess good writing skills in addition to creativity and management ability. Salary commensurate with experience, education and abilities. Exceptional benefit package includes profit sharing plan. Broadcast Electronics is located in a pleasant midwestern city of 50,000 population. Excellent working environment in a modern 70,000 sq. ft. air conditioned headquarters/manufacturing complex. Please send resume in strict confidence to Steve E. Wall, Director of Personnel.

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4100 N. 24th ST., PO BOX 3606, QUINCY, IL 62305, (217)-224-9600

Wheatstone Corporation

CONSOLE TEST ENGINEER

Audio console manufacturer seeks experienced people for technical department. Solid background in console testing and audio measurements is important. Light engineering skills valuable as position will require frequent involvement with design and engineering departments. Good growth opportunity. Send resume to: Andrew Calvanese, Wheatstone Corporation, 6720 V.I.P. Parkway, Syracuse, NY. 13211

Director, Special Projects

The National Association of Broadcasters Department of Science and Technology is seeking a Director of Special Projects. Responsibilities include editing and producing NAB's Engineering Handbook, organizing NAB's Spring Engineering Conference and Special Technical Exhibits, managing several key department projects and initiating new technical projects to better serve NAB's members. A technical background in the radio and television industry together with strong writing and communication skills is required.

Please forward resume to
 Michael C. Rau, Vice President
 Science and Technology Department
 National Association of Broadcasters
 1771 N St., NW
 Washington, D.C. 20036
 or please call (202) 429-5346.

EOE/M/F

TAPES . . . WTS

Metal reels, (129) 10.5" w/2780 cuts of Big Band/Nostalgia music, includes 10 reels of Big Band Era christmas music, comes w/ extensive documentation, all reels w/artist & title separation, all cuts in stereo, \$30 per reel or will trade for equip. S Callahan, WFTI, 1120 Pinellas Bayway #103, Tierra Verde FL 33715. 813-866-3544.

Sound Ideas Sound Effects Library, 13000 sounds, 125 boxed reels, catalogue w/locator nos., 15 ips, new, \$700/BO. B Ardis, Voice-Works, 4160 W 182nd #208, Torrance CA 90504. 213-214-2642.

Want to Buy

Thesaurus, World & Associated 12 transcriptions by various instrumental artists. J Leon, Leon Recdg Sld, POB 51, Jackson Hghts NY 11372. 800-221-0605 or 718-383-7212.

KCS-20 type small U-matic carts for BVU-100 VCR's, also gd used Beta carts. C Lund, 203-756-7761 aft 4PM.

Aristocart cart pads, need approx 200 for the old black square Aristocart carts that were made in Canada. E Fess II, WLRB, 119 W Carroll, Macomb IL 61455. 309-833-5561.

RCA 16" Thesaurus or other transcriptions. W Davies, Virgo Prod, 5548 Elmer, N Hollywood CA 91601. 818-761-9631.

Top 40 record library's rock oldies from the 50's, 60's & 70's, in fair cond, albums as well as 45's, no tapes. B Coleman Jr, WIST, Box 460, Lobelville TN 37097. 615-593-2294.

Video tapes: classic movies & cartoons of classic films that are in the public domain, for LPTV, would buy or rent. Dee, 334 N State, St Ignace MI 49781. 906-643-9494.

TAX DEDUCTIBLE EQUIPMENT

Eng student desiring donation of old bdct equip (anything in repairable cond, will pay all shipping charges, EE student at Purdue. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

R-R 10-1/2", 2 chnl stereo recorder needed & 16mm film sound projector for purposes of religious education. J Acuna, Cruzada, POB 760273, OKC OK 73176. 405-631-5877.

FM xmttr, 250-100 watt; also (3) deck tape recorders & R-R & 120' tower, 1-4 bay antenna, sportscaster board. J Setzer, Christian Entertainment Ministries, POB 93, Brookfield MO 64628. 816-376-2502.

Gatesway stereo control board/mixer, Executive or Diplomat, 10 mixing chnl; Ampex R-R recorder 601 mono or stereo; Russco or other similar brand Cue Master. Donation or token price, will be used in religious FM in foreign country. D Daniell, Apdo Postal 310, 53102 Cd Satellite, Mexico. 011-525-572-4568.

Mission of the Queen of the Holy Rosary is seeking donation of all types of audio & video equipment. Most need at this time R-R, cart machines & stereo console. Tax deduct donations. Mission of QHR, 865 Seneca Creek, W Seneca NY 14224.

Seeking 3-deck BE cart machine, cassette decks. C Sparr, WVMR, Rt 2B, Dunmore WV 24934. 304-799-6004.

Small Christian radio needs small console & (2) turntables & (2) cassette decks, free donation. Kisk, 407 S New Madrid, Sikesston MO 63801.

Christian Bdct Ministry seeks donations of production equipment to construct studio. We need everything top to bottom, to begin producing several non-profit bdct ventures. We'll pay postage charges. TGATS, Inc., POB 42, Medford OR 97501. 503-773-3200.

ED FM needs 4 bay antenna, carts, records, any format. M Koscak, WSKB, Western Ave, Westfield MA 01085. 413-562-1950.

Elementary school needs donations of bdct equip, anything in gd working cond, will pay shipping chgs. Linda Minton, KdSTAR, 1325 N Shumway Ave, Chandler AZ 85225. 602-786-7120.

Non profit station seeks donation of 16mm movie cameras & equipmt in any cond. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Non-profit missionary station in El Salvador needs 8008's in any cond so long as the bases, pins & plate caps are gd, will pay shipping; Also need 892R's for xmttr, will pay shipping. J Counter, YSLE, 5484 San Patricio Dr, Santa Barbara CA 93111. 605-967-6410.

Radio station at small liberal arts college is looking for donations of bdct equip. Cart machine compressor, FM exciter, EBS monitor, etc. Will pay shpg or pick up. B Luginbuhl, Bluffton College, Box 1327, Bluffton OH 45817. 419-358-8015 X214.

TEST EQUIPMENT

Want to Sell

Delta Electronics OIB-1 0.5-5 mHz operating impedance bridge, \$1150. E Haskell, 6620 Old Madison Pk Ste 304, Huntsville AL 35806. 205-722-0453/(w)205-464-4179.

TEST EQUIPMENT We Buy and Sell

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Potomac Instruments FIM-21 field strength meter .54-1.6 MHz, excel cond, \$900. J Anderson, W 621 Mallon, Spokane WA 99201. 509-326-6229.

B&W audio osc, \$200; B&W dist meter, \$300; (3) Comrex TCB-1 phone line couplers, \$100 ea; Gates SSA-3 silence sensor, \$50. B Clark, WFAS, Secor Rd, Hartsdale NY 10530. 914-693-2400.

Bruel & Kjaer 4220 piston phone, calibration standard for sound meas sys, mics, analyzers, etc, in wood box w/barometer & adapters, manual & datasheet (4), \$500. C Elmasian, Tri-Core Rec, 2750 5 Mile Rd, Livonia MI 48154. 313-427-8784, before 2PM.

EICO 277 audio generator, \$50. S Weber, KGRV, POB 1598, Winston OR 97496. 503-679-8185.

Fluke DMM 8050A, excel cond, \$375. J Claybrook, WMJJ, 530 Beacon Pkwy W Ste 600, Birmingham AL 35209. 205-942-9600.

Leader LAG-120A AF signal gen, \$200; Leader LSG-16 RF signal gen, \$75, both units in excel cond, original boxes w/manuals. B Turner, Turner Audio, Box 788, Ridgefield CT 06877. 203-438-1603.

Potomac 120E AM field strength meter, \$1100/BO. P Huback, 1209 St Joseph St, Gonzales TX 78629. 512-672-3516.

Simpson 458 oscilloscope, old but works, manuals, \$200/BO. R Fess, WLRB, 119W Carroll, Macomb IL 61455. 309-833-5561.

Want to Buy

Leader 120A, 120B, 125 or 126S audio generator & Leader LDM 170 or 171 distortion meter. H Yund, WTKI, 2200 15th, Gulfport MS 39501. 601-863-3522.

TRANSMITTERS

Want to Sell

FM Transmitters

5 kW 1976 CCA 5000 DS
1 kW 1971 CCA 1000 DS
OPTIMOD 8000A
Pat Martin
PMA Marketing
414-482-2638

BE 3.5 kW FM, 4 yrs old, without exciter, \$16,000. L Blakeney, WBBN, Rte 2, Box 273B, Taylorsville MS 39168. 601-729-8100.

Collins A830W 10 W FM, tube type FM exciter, tuned to 99.5; Also Harris TE-3 FM exciter tuned to 104.1 incl Orban baseband, \$1000. J Bahr, WVIS, Box 487, Frederiksted, St Croix US Virgin Islands, 00841. 809-778-5199.

Filament xformer for Collins 830F series FM xmttr, new in box. C Leasure, WTBO, POB 1644, Cumberland MD 21502. 301-722-6666.

Gates BC1F currently in operation, avail 6-89. D Tabor, WHCK, Box 158, Scottsville KY 42164. 502-237-3149.

Gates FM-5B w/Wilkenson exciter, in working cond, w/spare parts & tubes, make offer. K Sleeman, WMMJ, 400 H, NE, Washington DC 20002. 202-675-4800.

Harris FM2.5K, excel cond w/exciter, tuned to 105.5 MHz, \$17,900. G Spicer, 1430 Olive, St Louis MO 63103. 314-241-8442.

Harris MW-1A (3) PA modules for 1-kW xmttr, working order, \$150 ea. M Patton, WXON, 6819 Cezanne, Baton Rouge LA 70806. 504-292-4189.

Harris MW-1A (3) PA modules for 1-kW xmttr, working order, \$150 ea. M Patton, WXON, 6819 Cezanne, Baton Rouge LA 70806. 504-292-4189.



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McMartin BF-25K, excel cond; Harris SX-1A fire damaged, for parts, also SX-1A spare parts kit; RCA BTA-500R AM for parts, many good 4-250A tubes. John or Mike, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

Parts for a RCA BTF 20 E1, BO, J Schloss, KICD, 2600 Hiway, Spencer IA 51301. 712-262-1240.

RCA MI-19086-B 12.5 kW UHF-TV filterplexer for ch 33, excel cond, \$1000. C Fox, WTUV, Greenfield Rd, Rome NY 13440. 315-476-4963.

RCA TTU-1B 1kW UHF plus an addtl unit for spare parts, on-air chnl 33, tunable from 24 to 41, BO, C Fox, WTUV, Greenfield Rd, Rome NY 13440. 315-476-4963.

Transceiver Heathkit SB102-1 covers all ham bands in excel working cond, BO or 1/2" recorder 4 head or what have you. Leo Meister. 201-667-2323.

Versacount V-322 10W FM exciter, tuned to any frequency, recently rebuilt, \$850. M Patton, WXON, 6819 Cezanne, Baton Rouge LA 70806. 504-292-4189.

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BTA-250M 250 watt AM, on 1240 kHz, vgc w/document, ideal low-power, PSSA or stand-by, avail immed, \$200/BO or will trade for 450 MHz RPU system. R Wolf, WMXR, POB 404, Woodstock VT 05091. 603-675-2506.

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Collins 1000 W 20V3 in excel cond, on air, 980 kHz, \$5300. Jeff Sigmon, WBZK, 803-684-4241.

CSI FM 3000E 3 kW xmttr, 95.3, excel cond. H Cochran, KITX, Box 886, Hugo OK. 405-564-3043.

Gates FM-10H3 (2) w/TE-3 exciter, 10kW FM xmttr at 92.9 MHz, worked when removed w/spare parts. BO, B Williams, KRWN, POB 1047, Farmington NM 87401. 505-327-4449.

Harris 2.5 kW, 1983 in excel cond, BO, T Ferebee, KLLR, POB 70, Walker MN 56484. 218-547-1200.

RCA BTA-1MX w/500 watt cutback, w/spare tubes & parts, BO, KA Lancaster, WRFS, POB 5523, Falmouth VA 22403. 703-373-4640.

McMartin B-910 spare transis/semiconductor kit for B-910, \$25; GE 4BT1A, 250 W FM xmttr, no exciter, needs work, \$200. P Russell, Boudoin College, AV Services Silts Hall, Brunswick ME 04011. 207-725-3066.

Kintronics power cutback interface w/cntactor 500 W in 47 W out, new cond; Kintronics power reducer for AM xmttr, BO; Kintronics RF switching relay, 110 volts, power capacity 10 kW, gd cond, BO, D Mussell, WTCW, POB 904, Whitesburg KY 41858. 606-633-2711.

RCA BTF20E 1975 20 kW, recently removed from service, spare final & parts, \$8000 firm. J Boyd Ingram, WBLE, POB 73, Batesville MS 38606. 601-563-4664.

RCA RTF1E 1 kW FM, fire damaged, for parts, etc, BO, M Black, WEOS, Geneva NY 14956. 315-789-8970.

RCA SD spare parts, transformers, reactors, capacitors, relays & more from mtr being junked. J King, WRQB, POB 1336, W Point MS 39773. 601-494-1450.

Rust 5 kW FM; Collins 20K 1 kW AM; Gates 250C 250 W AM, PCB's removed, needs plate transformers, lots of spares, call for more details, BO, G Nicholas, KXIC, I-80 at N Du-Buque St, Iowa City IA 52241. 319-354-9500.

Willkinson FM10E, working when removed, BO/trade. M Koscak, WSKB, Western Ave, Westfield MA 01085. 413-562-1950.

Want to Buy

McMartin Md B-910 with or without stereo, any cond, also looking for some loose modules. Goodrich Ent. Inc, 11435 Manderson, Omaha NE 68164. 402-493-1886.

1 kW LPTV xmttr or translator or amplifier wanted, any make, used/demo, any year. S Kafka, Ste 902, 941 O St, Lincoln NE 68508. 402-476-6115.

AEL AM5KD or AM10KD exciter-driver unit and/or oscillator PC card. R Jenkins, WAVL, POB 277, Apollo PA 15613. 412-478-4020.

Any Solid State, 1kW AM rebuildable. R Hobbs, WMLR, Rt 1 Box 402B, Hohenwald TN 38462. 615-796-5966.

Any 1.0 kW FM, exciter optional. RM Posey, 400 3rd Ave, Jasper AL 35501. 205-221-2222.

RCA BTA1S, operating cond, prefer 660-780KHz, original freq. L Amstutz, Lumiere Haiti, 4526 Arlington, Ft Wayne IN 46807. 219-429-8366.

Any 20 or 25 kW FM xmttr, prefer recent model. H Cochran, KITX, Box 886, Hugo OK. 405-564-3043.

FM 2.5 to 3.5 kW for new Class A FM in central Indiana, no junk please. J Bulmer, 216-964-9890 or 997-1025.

Harris 20 kW FM less than 10 yrs old in gd to excel cond. T Ferebee, KLLR, POB 70, Walker MN 56484. 218-547-1200.

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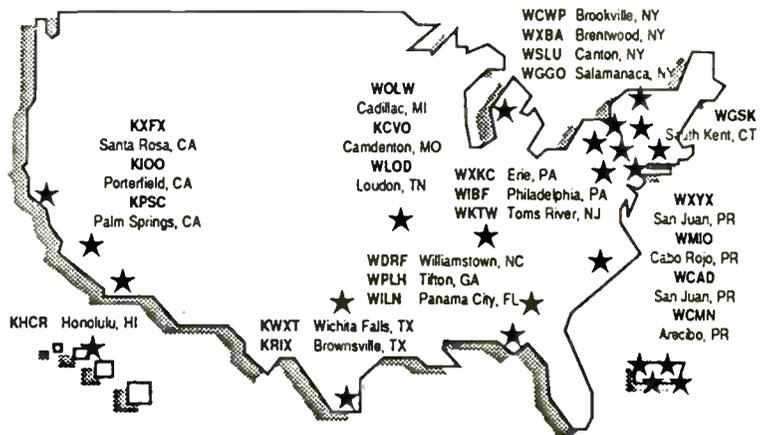
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- 1978 Collins 820F, 10 kW AM
- 1966 Collins 21E, 5 kW AM
- 1970 CCA AM 10,000D, 10 kW AM
- 1976 CCA AM 50,000D, 50 kW AM

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TUBES

Want to Sell

EIMAC 3CX1500A7 1500 watt triode, 1987 date code, new in box, \$550. Lauren Libby, Colorado Educational Bdcts, 6166 Del Paz Dr, Colorado Springs CO. 719-593-9861.

ELECTRON TUBES

Partial List: 6623, 23791, TH150, 6425F, 5604, 6696, 6697, 5681, 5682, 5671, 7804, 3CX10, 000H3, 3CX20, 000H3, 4CS5000A, 4CX35, 000C

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3CX 3000 F1, used but good, \$110. J Cunningham KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

4CX500 rebuilt, used 2 mos., no longer needed, \$500. J McDermott, KCVO, POB 800, Camdenon MO 65020. 314-346-2763.

RCA 6161, 6181, used in RCA TTU-1B 1kW UHF-TV xmtrs, fair-excel cond, negotiable. C Fox, WTUV, Greenfield Rd, Rome NY 13440. 315-476-4963.

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UHF xmtr tube 6806, 4CX250B used tube, make offer. C Haynes, POB 31235, Jackson MS 39206. 601-948-1515.

UHF xmtr tube 6806, 4CX250B used tube, make offer. C Haynes, POB 31235, Jackson MS 39206. 601-948-1515.

RCA 6806, one new, 5 used, 12 kW UHF TV tubes in RCA TTU12 xmtr, \$3000/BO. C Fox, WTUV, Greenfield Rd, Rome NY 13440. 315-476-4963.

Tubes: (3) 4-400; (3) 4-250, some new, some used, \$25 ea. S Engelke, WWDJ, POB 970, Hackensack NJ 07602. 201-343-5097.

Want to Buy

REBUILT ELECTRON TUBES

Partial List: 6623, 23791, TH150, 6425F, 5604, 6696, 6697, 5681, 5682, 5671, 7804, 3CX10, 000H3, 3CX20, 000H3, 4CS5000A, 4CX35, 000C

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TURNTABLES

Want to Sell

RCA MI-11870 (2) 16 universal pick-up arms. D Ibel, KICD, 2600 N Highway Blvd, Spencer IA 51301. 712-262-1240.

Gates 77 w/Microtrak tone arm, BO. D Tabor, WHCK, Box 158, Scottsville KY 42164. 502-237-3149.

Kenwood semi-auto, gd cond, dust cover, very stable, \$80. P Wolf, 813-574-5548.

QRK 3 speed, no tonearm (2), gd cond, \$75 ea. B Reck, WPTL, POB 909, Canton NC 28716.704-648-3576.

Technics SP 10 MKII; Technics 10B3; DV 505, 4 yrs old, excel cond, BO. J Brown, Acme Recdg Sld, 112 W Boston Post Rd, Mamaroneck NY 10543. 914-381-4141.

Technics SP-15 (4), \$350 ea; AT 12T tone arms (2), \$75 ea or \$800/all; Shure SME tonearms 3009 (2), \$25 ea. R Delius, WFXC, 2515 Apex Hwy, Durham NC 27713. 919-596-2000.

Empire (5); (1) Sparta, \$200/all or BO. R McDaniel, KJRG, Box 567, Newton KS 67114. 316-283-5150.

Grampion feedback cutting system, mono 150 watt Gotham amp & pwr supply, head is gd cond, amps as is, has hum in amps, \$400. HL Sewell, Oakridge Studio, 2001 Elton, Ft Worth TX 76117. 817-838-8001.

Presto 1-D cutting heads 500 ohm, excel cond, long shank sapphire cutters, \$50; sapphire cutting stylus dural shank long sapphire cutting needles new for LP groove & 45's, \$5/BO. ER Arn, Film Assoc., 7240 Paragon Rd, Dayton OH 45459.

QRK (2) 3 speed, one a corner control design the other center control, no tonearms, \$150/both. B Reck, WPTL, POB 909, Canton NC 28716. 704-648-3576.

RCA/BE BQ-50, BDR-1, BA-36A tables/arms on damped, castered RCA steel cabinets w/RCA stereo preamp/EQs. J Vengroskie, Soundscenes, 11700 Old Columbia Pk Ste L-3, Silver Spring MD 20904. 301-622-9318.

Russco 505, vgc, \$300 pls frt. J Monroe, WRYD, 900 River, Palatka FL 32077. 904-325-4558.

Russco Studio-Pro vgc, (2), \$100 ea. M Brown, 3740 SW Comus, Portland OR 97219. 503-245-4889.

Technics SH-15B3 base for SP15/25, new, \$100. F Grundstein, WEGX, 3 Bala Plaza Ste 580E, Bala Cynwyd PA 19004. 215-667-3939.

Technics SP-10 Mk II turntable systems (2) w/glass base, PS, Micro-Trak arms & 681-SE's, \$3K firm. Pat Appleson Stds, 305-625-4435.

Technics SP-10 Mk II turntable, no base, no arm, \$475; 16 chnl 2005 AD Inc road board w/spares, \$1200. Pat Appleson Stds, 305-625-4435.

Want to Buy

Turntable, 16", stylus, pre-amp in operating cond. Joel Blake, 201-423-5395.

TV FILM EQUIPMENT

Want to Sell

B&H 540 Series 16mm sound projector, vgc, pix & sound fine, 2" F-1.6 lens, 1000 W lamp, \$200/BO pls UPS shpg. B Leslie, Pro Recdg Srvs, 13709 Mapleleaf Dr, Cleveland OH 44125. 216-662-1435.

Moviola UL-20-535 one film head, one sound head 16mm film editor, complete, \$1500. P Russell, WBOR, Sils Hall, Brunswick ME 04011. 207-725-3066.

Projector 16mm sound DeVry Jan top of the line in excel cond, 35mm 3 gang syncisciser, 35mm splicer, 16mm snd camera Auricon Pro 1200 complete opt mag in new cond w/zoom lens, BO or consider home 1/2" recorder, 3/4" recorder portable w/camera for news. Leo Meister. 201-667-2323.

Quad-eight film mixer, 6x1, EQ, compressor, filters, no pwr supply, \$1200; Westrex 3x1 mic mixer for production, \$1100. J Gaffney, Ross-Gaffney, 21W46th, NNY 10036. 212-719-2744.

RCA 35mm film recorder excel cond, \$3500; Moviola 35mm upright (1) Moviola(1) Pix sound head, \$5000. J Faggney, Ross-Gaffney, 21W46th, NNY 10036. 212-719-2744.

VIDEO PRODUCTION EQUIPMENT

Want to Sell

Hotronic AD51-TFS frame sync/TBC, \$4000; Prime Image TBC+, \$2750; Lenco TBC-450, \$2500. H.M. Dyer Electronics, 2982 Wixom Rd, Millford MI 48042. 313-685-2560.

Panasonic twin 9" B&W monitors, \$100; RCA TT-1A video delay EQ system, \$75. C Haynes, POB 31235, Jackson MS 39206. 601-948-1515.

Panasonic twin 9" B&W monitors, \$100; RCA TT-1A video delay EQ system, \$75. C Haynes, POB 31235, Jackson MS 39206. 601-948-1515.

Quantel DPE5000SP digital effects, \$7000/BO; Panasonic AV700/NYA970 3/4 time code editing controller & VTRs, \$6000/BO; Ampex/3M 1" & 3/4" video tape; Bosch Compositor II CG, \$6000/BO. J Workman, Maritz, 600 W Lafayette, Detroit MI 48226. 313-963-1200 X501.

Ward TA-860 predistortion correction processor, can be used on a wide variety of older TV xmtrs, needs cleaning, make offer. C Fox, WTUV, Greenfield Rd, Rome NY 13440. 315-476-4963.

Trompeter LPL-75, video patch plugs, 1" pin spacing, new (24), \$3 ea; Vital VI-500 video stab amp w/cable EQ, incl manual, \$100; Co-hu 2614-400 video waveform multiplexers (2), \$50 ea. B Humpherys, Utah State Univ, Logan UT 89322. 801-750-3133.

Ampex VPR-80/TBC 80 boards & access & heads, all types, call; Sony 1" alignment tapes & Tentelometers, \$100 ea. D Brassell, Video Services, 424 Commerce Lane #5, Berlin NJ 08009. 609-768-2439.

CVS 506 timing corrector, one line heterodyne processor perf for editing—remove skew error, excel cond w/updates & man, \$1200; IVC/Quantel TBC-2000 direct-only, full bandwidth 4-line TBC (2) w/svc manual, \$1800. TFG, Box 9, Wethersfield CT 06109. 203-527-2972.

Jatex VSEC-42T editor/controller config for Sony 3/4" top loading VTR, cables & book, BO. A Zand, Villanova Univ, Villanova PA 19085. 215-645-4285.

JVC KY-210B (3); JVC KY-210; JVC KY-2000 w/std pkg; (2) JVC RS-500U CCU's w/cables; JVC KM-2000U switcher; (3) Sony 6800 port recorders; (2) Sony 5850/5800/RM440 editing sys, plus more, call for details. Richard, 206-754-7081.

Micro Script II video titler/character gen/bar gen, vgc, \$150. D Bailey, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

Shintron 505 video typewriter character gen, gd cond, \$350. G Sive, POB 239, Bonsall CA 92003. 619-749-7662.

Want to Buy

JVC VHS BR8600U edit deck, working or not, must be intact. G Sive, POB 239, Bonsall CA 92003. 619-749-7662.

VIDEO TAPE RECORDERS

Want to Sell

NEC 3/4 time lapse, \$450 plus UPS. J Baltar, Maine Reel, 67 Green, Augusta ME 04330. 207-623-1941.

Sony SLM-1000, pair of Beta off-line editing decks, bi-super high band, pre-roll editing, hi-gi stereo, \$2450. C Wilson, Mongo Video, 13123 Moldridge Rd, Wheaton MD 20906. 301-949-1809.

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Sony VP-2000 & Panasonic NV 2110M, \$95 ea/postpaid. L Graziplene, Graifen Research & Development, 3532 N Main, N Java NY 14113. 716-535-7251.

NEC 3/4" video cassette player, like new, \$175. C Haynes, POB 31235, Jackson MS 39206. 801-948-1515.

Sony VO-3800 field recorder w/AC-3000 power adapter, \$600. L Albert, WKMS, POB 2266, Murray KY 42071. 502-762-4664.

JVC KY-210B (3); JVC KY-210; JVC KY-2000 w/std package; (2) JVC RS-500U CCU's w/cables; JVC KM-2000U switcher; (3) Sony 6800 portable recorders; (2) Sony 5850/5800/RM440 editing systems, plus more, call for details. Richard, 206-754-7081.

Sony VP-2000 3/4" deck, needs minor repairs, \$95PP; Panasonic NV2110M 3/4" needs minor repairs, \$95PP. L Graziplene, Macrotel, 3532 N Main, N Java NY 14113. 716-535-7251.

Want to Buy

Need charger/AC supply & good used batteries for Panasonic NV 9400; also camera cable for Sony, will consider buying complete system. Patrick, Video Velocity, Box K, 500 Fandango Pass, Virginia City NV 89440. 702-847-9847.

Sony SLO-340 or SLO-320 Beta portable, operating or not, repairable, shoulder strap for BVU-100, carry bag. C Lund. 203-756-7761 aft 4PM.

Sony VO-6800 portable 3/4" U-matic VTR, AC-PS, 8-NP1's w/charger, kangaroo case/strap incl., \$2950.

Sony RM-430 edit controller in used/repairable cond, consider complete editing outfit if reasonable. C Lund, 203-756-7761 aft 4PM.

Ampex/Sony 1" type C w/TBC, must be in gd working cond. G Sive, POB 239, Bonsall CA 92003. 619-749-7662.

ACTION-GRAM

Equipment Listings

Radio World's Broadcast Equipment Exchange provides a FREE listing service for all broadcast and pro-sound end users. Simply send your listings to us, following the example below. Please indicate in which category you would like your listing to appear. Mail your listings to the address below. Thank you.

Please print and include all information:

Contact Name: _____
Title _____
Company/Station _____
Address: _____
City _____ State _____ Zip _____
Phone Number: _____

I would like to receive or continue receiving Radio World FREE each month. YES NO

Signature _____ Date _____
Please circle only one entry for each category:

I. Type of Firm

- | | |
|------------------------------|---------------------------------|
| D. Combination AM/FM station | F. Recording studio |
| A. Commercial AM station | G. TV station/teleprod facility |
| B. Commercial FM station | H. Consultant/ind engineer |
| C. Educational FM station | I. Mfg, distributor or dealer |
| E. Network/group owner | J. Other (specify) _____ |

II. Job Function

- | | |
|-----------------------|---------------------------|
| A. Ownership | D. Programming/production |
| B. General management | E. News operations |
| C. Engineering | F. Other (specify) _____ |

Brokers, dealers, manufacturers and other organizations who are not legitimate end users can participate in the Broadcast Equipment Exchange on a **paid** basis. Listings are available on a \$25/25 word basis. Call 1-800-336-3045 for details and complete display rates.

WTS: WTB: Category: _____

Make: _____ Model #: _____

Brief Description: _____

Price: _____

WTS: WTB: Category: _____

Make: _____ Model #: _____

Brief Description: _____

Price: _____

WTS: WTB: Category: _____

Make: _____ Model #: _____

Brief Description: _____

Price: _____

WTS: WTB: Category: _____

Make: _____ Model #: _____

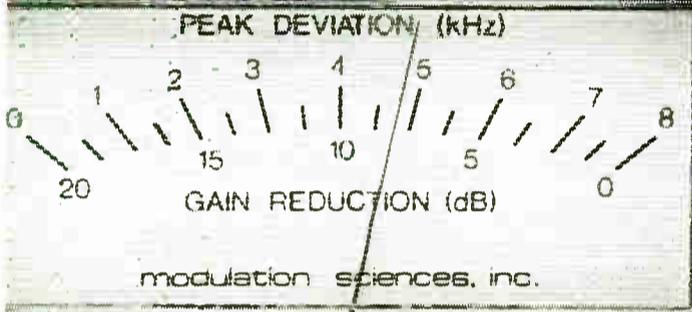
Brief Description: _____

Price: _____

Broadcast Equipment Exchange

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E.J. PRYOR, JR. Broadcast Technologies, Inc.

"I have been operating one SCA on 67kHz on my Dallas, TX station for some years. After many years of the normal problems of crosstalk, noise, etc., Modulation Sciences came forward with the 'Sidekick' SCA generator. I have never spoken out for a particular device in this column before, but I found that virtually every problem I had been experiencing, disappeared when I finally got one of these units and installed it at the studio between my stereo generator and composite STL. I found that the crosstalk, main to sub and sub to main, was improved almost 20db and the system noise was markedly improved also. There is no measurable degradation to the stereo performance or loudness whatever. With the new rules allowing stations to increase their total modulation 5% for each 10% of injection, the main channel (mono) level suffers a negligible 0.5db reduction in loudness."

Reprinted by permission from Broadcasters ID. Aug/Sept 1985

30-Market Survey Results:
SIDEKICK IS THE
#1 CHOICE OF MUSIC
SCA OPERATORS.

From SCA: Radio Subcarrier Report

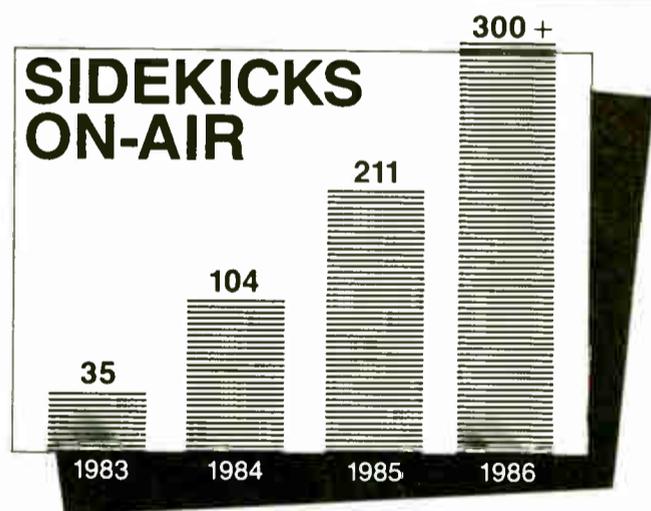
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Here's how Sidekick® makes SCA work:

Sidekick installation is quick, easy, and problem-free:

- Install at studio or transmitter.
- Insert anywhere in chain via Sidekick's loop-through composite input/output (SCA input NOT required).
- Remote control provisions standard.

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- Sidekick is tweak-free and drift-free.
- Crystal-locked synthesizer is stable over time/temperature.
- Excellent RF and EMI shielding.
- Performance certified by an independent P.E. (to receive a copy, just call).

Sidekick's "One Box Solution" builds in everything you need:

- Integrated audio processor for superb SCA performance.
- Noise generator and synchronous AM meter lets you tune transmitter for minimum crosstalk.
- Super-accurate peak & hold SCA deviation monitor.

Call Toll-Free (800) 826-2603
And Get Sidekick Working For You.



Kiss 102

October 17, 1988

Mr. Gary Snow, President
Wheatstone Corporation
6720 V.I.P. Parkway
Syracuse, NY 13211

Dear Gary;

I just wanted to drop you a line and let you know how much we appreciate all of the last minute help with the installation of our A-500 console back in July.

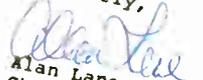
Thanks to you and your staff, we were on the air with the new facility on time and without a single glitch. The A-500 console is a winner!

Our staff enjoys the ease of use of the console, and I enjoyed the ease of installation. Everyone here enjoys our improved audio performance. We would recommend the console to anyone.

By the way, our SP-6 has been installed now for a few weeks and we are taking advantage of it's great features and performance. The SP-6 is a wonderful piece of equipment. Again, the installation was easy, and the SP-6's straightforward layout and design make the functions easily accessible and understandable to operations personnel.

You stood by your promise that Wheatstone is a service-oriented company...and then some. Thanks again, Gary, for providing an outstanding product with service to match.

Sincerely,


Alan Lane
Chief Engineer

WCKZ
Bassley Broadcast Group
704-342-4102

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